

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE:

AGENCY/DEPARTMENT: USDA APHIS PPQ

PRIMARY CONTACT PERSON: Philip Berger

Program Status: ☒ Current or ongoing ☒ Proposed

Technical Program Objective(s): *(limit to 150 words)*

APHIS PPQ is responsible for safeguarding US crops and natural plant resources against the introduction of exotic plant pests and pathogens, as well as dissemination of pests and pathogens established in the US but of limited distribution. Rapid detection and identification of select agents and regulated pests is a key component of the PPQ safeguarding mission. Rapid detection and identification of pests and pathogens affecting hundreds of plant hosts and commodities, requires diagnostic tests that are rapid, sensitive, highly specific and validated. APHIS has developed highly integrated programs of methods development and validation, training programs for diagnosticians, and is developing a National Lab Accreditation Program for labs performing diagnostics tests.

Impact to Homeland Security: *(What is the outcome? Money saved, lives saved, better protection, support prosecution or forensic investigation, etc.? limit to 150 words)*

The programs listed above impact food security, US crop production efficiency and the sustainability of natural resource areas such as national parks, forests and grasslands. APHIS PPQ has improved its ability to respond to and recover from the impact of dangerous exotic pests and pathogens through rapid and unambiguous identification of these agents. Many aspects of our safeguarding mission will be aided, particularly detection, surveillance, response and recovery. Increased capacity, decreased response times, and improved interception efforts will reduce losses due to exotic pests. Reduced losses result in less costly emergency actions and overall financial savings for US industry and consumers.

Background/Problem: *(What is the fundamental issue? E.g., lack of standards for bio agent detection? Inadequate technology for ...? limit to 150 words)*

Technology development is an ongoing process in APHIS PPQ. Some work is accomplished at the expense of essential programs due to resource limitations. 1) A state-of-the-art training center is needed to provide training to federal and state diagnosticians in the use of PPQ-validated diagnostic tests. 2) Current technology for validating diagnostic tests often lack adequate basic information due to insufficient rigor or expansive procedures. 3) Development of proficiency panels for some plant pathogens and other agents is particularly challenging due to the unusual or unknown biological characteristics of many bacterial, fungal or viral agents. 4) There are unmet needs in terms of quality management.

5) The National Lab Accreditation Program has significant staffing and infrastructure requirements. APHIS PPQ performs many of the functions listed above but with insufficient staff and infrastructure.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

APHIS PPQ interacts with many federal and state agencies, the private sector, universities and foreign governments. Many diagnostic tests and methods used by APHIS PPQ are the result of research performed by scientists in USDA-ARS, other federal labs, universities, foreign research centers and the private sector. Synergy is gained between APHIS PPQ diagnostics efforts and technologies deployed at US ports of entry (including DHS Customs and Border Protection). Lab diagnostics performed by APHIS PPQ and external laboratories requires integration and cooperation between state departments of agriculture and labs in the National Plant Diagnostic Network (NPDN; USDA-CSREES). Related efforts include APHIS Veterinary Services with the National Seed Health system and programs importing exotic germplasm.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The program has several components that require increased or new capacity in the form of infrastructure and personnel:

- 1) Design and develop the National Training Center for Diagnostic Methods for Plant Pathogens. The Center will develop and deliver training programs to diagnosticians in state, NPDN or private labs. Staff, presently involved in developing and/or validating diagnostic tests or responding to emergencies, must also deliver training programs in existing facilities. This results in developmental staff being pulled away from critical activities to conduct training in R&D labs not designed for training programs.
- 2) Method validation and method development facilities and staff must be separated. These processes are intermingled, resulting in lower productivity and effectiveness, at the expense of other programs.
- 3) Proficiency panel development and deployment processes currently have no dedicated staff or facilities.
- 4) APHIS PPQ has substantial efforts in method development but must increase testing capacity. For example, there is a critical need to adapt existing diagnostic protocols to high throughput platforms, but few staff or limited infrastructure to effect this. Diagnostic tests for plant pathogens of high consequence have received emphasis. Methods development in entomology, malacology, nematology, acarology, and weed science also require attention. APHIS PPQ must have technical capacity in all of these areas. In addition to increasing national capacity for development and deployment of lab-based methods, there is an even greater need to transition technologies suitable for field deployment to minimally trained inspectors and officers. Field applications include use at ports of entry, plant introduction

stations, offshore pest detection and mitigation programs and domestic survey and emergency response programs.

5) Several programs listed above will be integrated into the National Lab Accreditation Program. The program is in early stages of development and requires facilities and staff. The National Lab Accreditation Program will require about two years to implement but may take longer if federal rule making is required.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: VULNERABILITY ASSESSMENTS AND MITIGATING STRATEGIES FOR COMMERCIAL NUCLEAR FACILITIES

AGENCY/DEPARTMENT: NUCLEAR REGULATORY COMMISSION

PRIMARY CONTACT PERSON: MARK CUNNINGHAM

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *The principal objective of the NRC's program is to assess and mitigate the potential vulnerabilities of commercial nuclear facilities to terrorist attacks. These efforts include examining the effects of potential terrorist acts against these facilities, and the mitigating strategies needed to protect facilities from such acts. These efforts have identified some specific areas where additional research is needed and the NRC is in the process of integrating these needs with planned and on-going research and coordinating these efforts with other agencies. Further work in the areas of structural response to energetic assaults, and fire analysis are two areas of ongoing research.*

Impact to Homeland Security: *The results of this program have informed the NRC's decision making process on implementation of additional measures at the affected facilities. Further, these efforts have informed our emergency preparedness efforts and highlighted the need for greater interagency coordination and coordination with local emergency responders. The intent is to further enhance the safety and security of the facilities, where necessary, in this sector of the nation's infrastructure and better prepare for integrated response with other federal agencies and local emergency responders.*

Background/Problem: *While nuclear facilities are among some of the more robust structures in the nation's infrastructure, the possibility of radiological exposure and contamination although unlikely draws considerable interest from a variety of sources. This has motivated the NRC to make every effort to provide assurance that the health and safety of the public is protected.*

Related Efforts: *The NRC is coordinating with other agencies to ensure the same critical infrastructure concerns that exist in other sectors are being addressed in the Commercial Nuclear Sector. The NRC monitors, where possible and appropriate, activities being conducted by the Department of Defense, DHS, FEMA, and other Federal Agencies.*

Proposed Program 2005-2007 Research/Plan:

There are three general research areas of particular interest to the NRC to inform the protection requirements for commercial nuclear facilities. These research topics aim to enhance the realism of regulatory decisions and

identify potentially effective additional mitigation strategies for nuclear facilities under attack or accident conditions.

Confirmatory Analyses

The NRC assessed a sample of nuclear power plants for vulnerabilities to aircraft attack causing damage to structures, systems, and components of the plants and potential releases of radiation. Through this work, a number of uncertainties and areas for further confirmatory research became apparent. The proposed confirmatory analyses will develop and evaluate both structural and fire analysis models. Two important areas of analysis are the potential for structural collapse or the failure of key piping systems from impact by large objects or post-crash fires. Additionally, the structural research will include improved simulation of the concrete debris generated after impacts by large objects and the fire research will reduce key uncertainties in the spread of burning fuel within a multi-level or multi-room building. The results of these confirmatory analyses will improve confidence in the vulnerability assessment results and in the technical basis for decision making.

Land- and Water-Borne Vulnerability Assessments

At the NRC, vulnerability assessments are systematic evaluations in which qualitative and quantitative techniques are applied to identify potential vulnerabilities and assess consequences for a range of threats. While nuclear power reactors already employ very robust protection strategies, the aim of this project is to further improve the realism of protection requirements while informing emergency planning. This research area involves applying probabilistic risk assessment tools to scenarios involving land- and/or water-borne attacks as initiating events at nuclear facilities. The results will inform the regulatory need for additional protection requirements for nuclear facilities and identify potentially effective mitigation strategies.

Spent Fuel Pool Analysis

Spent fuel from nuclear power reactors is stored in pools to provide long term cooling. Analyses of spent fuel pool accidents, in the past, used conservative models and assumptions with respect to fuel heatup, damage and release of radioactive material. Current experiments and analyses aim to provide a more mechanistic, realistic and integrated calculation of spent fuel pool accidents. Results of this research will inform regulations regarding spent fuel pool safety and additional mitigation strategies under accident conditions.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: SECONDARY ECONOMIC EFFECTS OF TERRORIST ACTIVITIES

AGENCY/DEPARTMENT: : Bureau of Reclamation, U.S. Department of Interior

PRIMARY CONTACT PERSON: David Achterberg, 303-445-2766

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *(limit to 150 words)*

Provide a technical foundation for evaluation of economic consequences of a terrorist attack. A field case study has been performed as a comprehensive analysis of the economic impacts of a terrorist attack. The economic consequences to be analyzed include direct and indirect impacts of a terrorist attack on the system. From this case a need for methods to do these studies has arisen.

Impact to Homeland Security: Better understanding of consequences of any attack.

Background/Problem: Economic impacts of natural and terrorist attacks are not well understood. The direct impacts affected include income, sales and employment, estimates of property damage, emergency services, loss of business income, loss of project benefits, reconstruction costs. Indirect ("multiplier") effects need a method to be developed for a total economic cost. There will also be some analysis/discussion of the special considerations and consequences of these items from a terrorist attack versus that of a natural event.

Related Efforts: Not aware of other efforts.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The Economics Group would like to perform a study to include a more thorough review of the methodologies available to determine indirect impacts from this type of event and, subsequently, perform a "case" study analysis using the various methods. There are at least 5 different economic "models" available to estimate the secondary impacts from this type of event. The models all have their advantages and disadvantages, which would be determined and discussed in the research effort. The models also vary by detail, cost, and difficulty of use and interpretation. Since there is no universal model to determine these impacts, we would like to systematically consider the various alternative models which could be used in this study as well as future studies of this nature.

Estimated costs \$0.07

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: BLAST RESISTANCE OF EMBANKMENT DAMS

AGENCY/DEPARTMENT: Bureau of Reclamation, U.S. Department of Interior

PRIMARY CONTACT PERSON: David Achtenberg, 303-445-2766

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To provide a technical foundation for the analysis of blast effects on embankment dams. Data is produced using scale models with comparison possible by computer codes. Foundation can support simplified analysis procedures of USCOE AT-Planner and more sophisticated FE analyses. Implementation of the results will help make decisions concerning the current safety, traffic patterns, and need for construction upgrades to embankment dams throughout the West and the remainder of the US.

Impact to Homeland Security: New techniques and guidelines have been produced and will be continue to be modified for the prediction of blast effects of varying sizes on embankments of different types. The results have increased the protection of lives from embankment dam's failures by identifying dams of highest risk from blasts on the top of the dam, particularly dams which are crossed by highways. Decisions to restrict traffic have been made, and plans are underway for possible hardening of features using initially tested or new techniques.

Background/Problem: Embankment Dams are particularly susceptible to progressive failure if a crater can be produced by a blast that will allow flow of a reservoir across the dam and result in an erosive failure of the dam. Extensive work has previously been completed of the effects of blast on flat ground and hardened structures. The embankment problem is different in that the blast is placed on a trapezoidal section and not contained in the same manner as a flat ground blast. In addition, embankments can be saturated, which is a different material than has been tested in the past. Embankments can have road surfaces and other layers. In many cases, state highways traverse the top of an embankment, making permanent closure from the top of the dam, difficult or expensive. As many dams are remote, inspection and monitoring of traffic is difficult.

Related Efforts: This work is done in cooperation with the U.S Army Corps of Engineers, and Sandia National Labs.

Proposed Program 2005-2007 Research/Plan General areas for development follow:

Expanding the Saturated Dams Data Base Additional physical model tests are planned for saturated dams to increase the understanding and calibration data available for these cases. These data will improve existing computer prediction methods, and provide data sets to confirm computer code analysis predictions.

Expanding the Protection Design Data Base Additional physical model tests are planned to ascertain the benefits of 1 or 2 promising designs.

Improving Computer Tools Existing computer programs will be updated or calibrated with existing information for the prediction of blast effects. Some new developments may be derived as the analytical work progresses.

Typical Protective Design Suggested or example designs for hardening of embankment surfaces will be developed.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: BLAST EFFECTS ON LARGE DAM OUTLET GATES

AGENCY/DEPARTMENT: Bureau of Reclamation, U.S. Department of Interior

PRIMARY CONTACT PERSON: Achtenberg, 303-445-2766

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To provide a technical foundation for the analysis of blast effects on outlet gates on dams. Data is produced using computer models. Blasts of different size and at different stand offs are being investigated to aid in the decisions for protection of critical facilities by stand-off or hardening.

Impact to Homeland Security The results will increase the protection of lives from possible gate failures by identifying dams of highest risk from blasts, better quantified of risk, and better understanding of effects of blasts and implementation of mitigation schemes. Potential design ideas will be compared on a cost and constructability basis to serve as a starting point for all future designs.

Background/Problem: Large gates in dams are used to hold reservoir elevations at certain levels for operations, but allow releases for river flow, flood flows, or other purposes. In some cases, gates if lost can produce flows which exceed channel capacity and possible loss of life. In some cases, the loss of gates, if not mitigated quickly, can result in losses of critical flows for crop or municipal use and consumption.

The potential damage from different sizes of blasts must be evaluated to assess the potential risk to/from a facility. Of particular interest in the analysis of gates is the underwater, so-called bubble, effect. Mitigation schemes need to be evaluated for protection of the gates. In this study, various protection schemes are being conceived and evaluated.

Related Efforts: Work is being done in cooperation with the Naval Surface Weapons Center.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

Complete Analysis of Blast Effects on Large Radial Gates and Mitigation Strategies

Ongoing analyses of large radial gates and their susceptibility to blast of different sizes and at

different standoffs will be completed. Simple mitigation schemes will be investigated using computer analysis.

Perform verification model tests Model tests will be performed to confirm effectiveness of mitigation designs.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: SECONDARY ECONOMIC EFFECTS OF TERRORIST ACTIVITIES

AGENCY/DEPARTMENT: : Bureau of Reclamation, U.S. Department of Interior

PRIMARY CONTACT PERSON: David Achterberg, 303-445-2766

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *(limit to 150 words)*

Provide a technical foundation for evaluation of economic consequences of a terrorist attack. A field case study has been performed as a comprehensive analysis of the economic impacts of a terrorist attack. The economic consequences to be analyzed include direct and indirect impacts of a terrorist attack on the system. From this case a need for methods to do these studies has arisen.

Impact to Homeland Security: Better understanding of consequences of any attack.

Background/Problem: Economic impacts of natural and terrorist attacks are not well understood. The direct impacts affected include income, sales and employment, estimates of property damage, emergency services, loss of business income, loss of project benefits, reconstruction costs. Indirect ("multiplier") effects need a method to be developed for a total economic cost. There will also be some analysis/discussion of the special considerations and consequences of these items from a terrorist attack versus that of a natural event.

Related Efforts: Not aware of other efforts.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The Economics Group would like to perform a study to include a more thorough review of the methodologies available to determine indirect impacts from this type of event and, subsequently, perform a "case" study analysis using the various methods. There are at least 5 different economic "models" available to estimate the secondary impacts from this type of event. The models all have their advantages and disadvantages, which would be determined and discussed in the research effort. The models also vary by detail, cost, and difficulty of use and interpretation. Since there is no universal model to determine these impacts, we would like to systematically consider the various alternative models which could be used in this study as well as future studies of this nature.

Estimated costs \$0.07

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: CRITICAL INFRASTRUCTURE PROTECTION DECISION SUPPORT SYSTEM (CIP - DSS)

AGENCY/DEPARTMENT: Department of Homeland Security, Science and Technology Directorate, Critical Infrastructure Protection Portfolio

PRIMARY CONTACT PERSON: Dr. John Cummings, 202-254-5802

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): Create a system model of the characteristics and dynamics of the Nation's critical infrastructure sectors and key assets, and especially their interdependencies, in order to provide insights to consequences of attack, choke points, and risks on national and regional scales.

This system is composed of a set of interdependent infrastructure models used to assess consequences of disruptions initiated in any one or combinations of the infrastructures. Using decision support methods such as multi-attribute utility theory, this system is a high-level risk-informed decision support tool and provides a platform to compare alternative investment strategies and trade-offs.

Impact to Homeland Security: With such a system, decision makers are given a tool to help understand the trade-offs they are making. This tool provides a risk-informed basis for setting priorities and making resource allocation decisions.

Background/Problem: Generally, individual infrastructures have a good understanding of their own vulnerabilities and system risks. However, a system of systems model is needed to capture the potential for cascading effects across all critical infrastructures in order to make better-informed major national and regional decisions and investments. Some first order interdependencies are known, but many of the 2nd and 3rd order interdependencies are not. Due to this lack on understanding of the relationships between infrastructures, a system that simultaneously models all critical infrastructures and their interdependencies was created.

Related Efforts: There are many related efforts within the various agencies, National Laboratories, and industry, each with a slightly different focus.

Proposed Program 2005-2007 Research/Plan: The CIP-DSS is based on a spiral development construct. With each spiral, the system becomes more in depth and more robust. At this stage, threat scenarios are being incorporated.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: PROTECTIVE SECURITY TECHNOLOGIES

AGENCY/DEPARTMENT: Department of Homeland Security, Science and Technology Directorate, Critical Infrastructure Protection

PRIMARY CONTACT PERSON: Dr. John Cummings, 202-254-5802

Program Status: X Current or ongoing Proposed

Technical Program Objective(s): To provide technologies that can increase security and reduce vulnerabilities within the Nation's critical infrastructures. To anticipate the emerging threats and current and future capabilities of adversaries and to develop technologies to anticipate, detect, deter, and reduce the consequences of the threats.

In the case of Insider Threats, the objective is technically more difficult. Insider threats must be countered using technologies to detect anomalous behavior, while protecting privacy laws.

Impact to Homeland Security: Through these programs, technologies addressing vulnerabilities within our critical infrastructures will be developed and deployed. By making these protective security technologies available and affordable, infrastructure owners and decision-makers will be able to implement them where needed thereby making our Nation's infrastructure more resilient.

Background/Problem: As vulnerability assessments are completed, areas where a site/infrastructure may be vulnerable are brought to attention. In some cases, there are gaps in technological security that can be addressed by a research and development program. In other cases, there may be an existing technology that may help mitigate the problem but it is too expensive for a private infrastructure owner to be able to implement it. A program may be developed to assist the private industry in making solutions more economically feasible.

Related Efforts: Many sources in the United States and abroad are developing such technologies.

Proposed Program 2005-2007 Research/Plan:

Currently there are a number of programs underway to provide short term technologies for pressing current problems and to establish a basis for making future investments. As the Information Assurance, Infrastructure Protection Directorate of DHS continues to conduct assessments of critical infrastructures, and as security technologies and the capabilities of our nation's adversaries evolve, CIP will seek out new requirements and capability gaps, and create programs to address those gaps as needed.

Chemical Sector Study: To assist the Department of Homeland Security (DHS) in its efforts to secure the U.S.'s infrastructure and economy against terrorist attack and other catastrophic loss, this study will examine the public health, economic, and national security importance to the United States of key chemicals and existing and alternative chemical processes.

End-to-End Water Study: To assist the Department of Homeland Security (DHS) in its efforts to secure the U.S.'s infrastructures and economy against terrorist attack and other catastrophic loss, this study will examine the public health, economic and national security importance to the United States of municipal domestic water security.

National Academy CIP Roundtable: The National Academies, through the Board on Infrastructure and the Constructed Environment of the National Research Council and the National Academy of Engineering, is planning to establish a roundtable aimed at addressing the most pressing vulnerabilities associated with critical interdependent infrastructure systems. A dialogue between government, industry, and academia will be established to facilitate development of a long-term strategy for reducing the vulnerability of the nation's infrastructures to debilitating failures, whether from terrorist acts, natural hazards, or accidents.

Quick Look Assessments: This program involves 90-day surveys of 10 of the critical infrastructure sectors.

Soft Metrics for Critical Infrastructure Protection: A study is planned to investigate and attempt to quantify social and behavioral consequences, or "soft metrics," as part of the consequences that need to be considered when making trade-offs in investments before an event occurs, or for evaluating alternative actions during response and recovery stages of a catastrophic event.

Vulnerability Assessments: Two studies are planned: Vulnerability Assessment of GPS Receivers, and Vulnerability Assessment of Undersea Cables.

Risk Assessments: This is a study to keep abreast of existing and emerging risk analysis methods.

Enhanced Scene Awareness (Closed Circuit Television (CCTV)): This program will assess ways to improve the effectiveness of CCTV. It will also examine measures to make the technology more affordable for private industry.

Water Treatment Utility Conversion from Gaseous Chlorine Disinfection: Since the September 11, 2001 terrorist attacks, the nation's water and wastewater treatment utilities have voluntarily assessed the vulnerabilities of their facilities and evaluated opportunities to decrease any resulting threats to their operations and/or the surrounding community. These assessments often include an evaluation of alternatives to gaseous chlorine as a disinfection method.

Enhancing Private Security Officer Surety-Study: This program will conduct a study addressing the issues of enhancing the surety of private security officers. It will have three major objectives: 1) Determine the existing requirements for and practices of background

Department Of Homeland Security, Science And Technology Directorate, Critical Infrastructure Protection

checks for private security officers; 2) Identify the resources available for obtaining background information; and 3) Develop a preliminary technical strategy or roadmap to enhance background checks for operational private security personnel.

Enhancing the Robustness and Resilience of Future Electric Transmission and Distribution in the United States to Terrorist Attack: This program will establish a committee of approximately 18 individuals to consider the future electrical transmission and distribution (T&D) system in the United States with respect to potential terrorist attacks. The committee will examine approaches for reducing vulnerabilities, enhancing robustness, and increasing the resilience and ability to recover from attacks. The study will address technical, policy, and institutional factors that may affect the evolution of electrical T&D in the United States in the midterm (e.g., 3 to 10 years) and the long term (10 to 25 years). The committee will identify priority technology opportunities, R&D directions, policy and institutional actions, and strategies that will lead to more secure electrical T&D in the future.

Process Control Security (PCS) Forum: This program is sponsoring the development of a forum that will share technologies, security issues, and develop recommendations for PCS.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: PROTECTIVE SECURITY TECHNOLOGIES

AGENCY/DEPARTMENT: Department of Homeland Security, Science and Technology Directorate, Critical Infrastructure Protection

PRIMARY CONTACT PERSON: Dr. John Cummings, 202-254-5802

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To provide technologies and devices to help mitigate vulnerabilities within the Nations critical infrastructure.

Impact to Homeland Security: Through these programs, technologies and devices which address vulnerabilities within our critical infrastructures will be developed. By making these protective security technologies available and affordable, infrastructure owners and decision makers will be able to implement them where needed thereby making our Nation safer.

Background/Problem: As vulnerability assessments are completed, by both DHS and other entities, areas where a site/infrastructure may be open for an attack are brought to attention. In some cases, there is no none technology or device to mitigate that vulnerability and a program may be started. In other cases, there may be an existing technology that may help mitigate the problem but it is too expensive for a private infrastructure owner to be able to implement it. A program may be developed to help bring down the cost of the technology to make it available to all who need it.

Related Efforts:

Chemical Sector Study:

To assist the Department of Homeland Security (DHS) in its efforts to secure the U.S.'s infrastructure and economy against terrorist attack and other catastrophic loss, the contractor will examine the public health, economic, and national security importance to the United States of key chemicals and chemical processes.

End-to-End Water Study:

To assist the Department of Homeland Security (DHS) in its efforts to secure the U.S.'s infrastructure and economy against terrorist attack and other catastrophic loss, the Offeror will examine the public health, economic and national security importance to the United States of municipal domestic water security.

National Academy CIP Roundtable:

The National Academies, through the Board on Infrastructure and the Constructed Environment of the National Research Council and the National Academy of Engineering, is planning to establish a roundtable aimed at addressing the most pressing vulnerabilities

Department Of Homeland Security, Science and Technology Directorate, Critical Infrastructure Protection

associated with critical interdependent infrastructure systems. A dialogue between government, industry, and academia will be established to facilitate development of a long-term strategy for reducing the vulnerability of the nation's infrastructure to debilitating failures, whether from terrorist acts, natural disasters, or accidental failures.

Quick Look Assessments

This program involves 90-day surveys of 10 of the 13 critical infrastructure sectors. We have presently received reports for the first two sectors - food & agriculture and information & telecommunications.

Soft Metrics for Critical Infrastructure Protection

A draft proposal is presently under review within DHS IAIP before being proposed to the S&T Directorate. Initially that task was focused on support to a workshop.

As corroborated by Michael earlier today, the workshop is no longer planned, so we are in the process of redefining the task.

Vulnerability Assessments

Vulnerability Assessment of GPS Receivers.

Vulnerability Assessment of Undersea Cables.

Risk Assessments

This task will not include the development of new analytic methods for conducting risk assessments. Specific analysis of risk assessment techniques can be conducted under this task. Operationalizing emerging risk assessment techniques and tools developed through the DHS University Centers of Excellence may be conducted under this task. This task should be coordinated with existing efforts under DHS sponsorship.

Enhanced Scene Awareness (Closed Circuit Television (CCTV))

This program will look at ways to improve the effectiveness of CCTV. It will also look at measures to make the technology more affordable for private industry.

Proposed Program 2005-2007 Research/Plan: Currently there are numerous programs under way. As the Information Assurance, Infrastructure Protection Directorate of DHS continues to conduct assessments of critical infrastructure sites, CIP will be updated with new technology gaps and create programs to address those gaps as needed.

Example programs:

Water Treatment Utility Conversion from Gaseous Chlorine Disinfection

Since the September 11, 2001 terrorist attacks, the nation's water and wastewater treatment utilities have voluntarily assessed the vulnerabilities of their facilities and evaluated opportunities to decrease any resulting threats to their operations and/or the surrounding community. These assessments often include an evaluation of alternatives to gaseous chlorine as a disinfection method.

Enhancing Private Security Officer Surety-Study:

This money will be used to conduct a study addressing the issues of enhancing the surety of private security officers. It will have three major objectives: 1) Determine the existing

Department Of Homeland Security, Science and Technology Directorate, Critical Infrastructure Protection

requirements for and practices of background checks for private security officers; 2) Identify the resources available for obtaining background information; and 3) Develop a preliminary technical strategy or roadmap to enhance background checks for operational private security personnel

Enhancing the Robustness and Resilience of Future Electric Transmission and Distribution in the United States to Terrorist Attack:

The contractor will establish a committee of approximately 18 individuals to consider the future electrical transmission and distribution (T&D) system in the United States with respect to potential terrorist attacks. In particular, the committee will examine approaches for reducing vulnerabilities, enhancing robustness, and increasing the resilience and ability to recover from attacks. The committee will use as a starting point the three recent reports addressing electric T&D in the nation, namely, the National Academies' report, *Making the Nation Safer: The Role of Science & Technology in Countering Terrorism*; the DOE report, "*Grid 2030, A National Vision for Electricity's Second 100 Years*," and the EPRI report, *Electricity Sector Framework for the Future*. The study will address technical, policy, and institutional factors that may affect the evolution of electrical T&D in the United States in the midterm (e.g., 3 to 10 years) and the long term (10 to 25 years). The committee will identify priority technology opportunities, R&D directions, policy and institutional actions, and strategies that will lead to more secure electrical T&D in the face of an uncertain future.

Process Control Security Forum:

This program is sponsoring the development of a forum that will share technologies, security issues, and develop standards for PCS.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: REAL TIME GRID RELIABILITY MANAGEMENT - EASTERN INTERCONNECTION PHASOR PROJECT (EIPP)

AGENCY/DEPARTMENT: Department of Energy, Office of Electric Transmission and Distribution

PRIMARY CONTACT PERSON: Philip Overholt, 202 586-8110

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To create a robust, widely available and secure synchronized data measurement infrastructure over the North American electric grid's Eastern interconnection with associated analysis and monitoring tools for better electric grid planning and operation, and enhanced reliability and security.

This project is a public/private partnership lead by the Department of Energy that includes major transmission utilities, Independent System Operators (ISO), Regional Transmission Organizations (RTO), equipment and software vendors, the North American Electric Reliability Council (NERC), and FERC in an EIPP Working Group. The goal of the project is to establish a real-time, GPS-synchronized, measurement network that will provide real time data to monitor and control the Nation's electric grid. Fundamental issues are optimal location of measurement units, data protocols, equipment and communications protocols and standards, and agreements for sharing data by utility participants. In addition to establishing the data collection network, the project task teams are defining visualization system needs, and system analysis software that runs on real time data inputs. The ultimate goal is to combine real time measurements with on-line analysis software to create an automatic, switchable electric grid that senses grid stress and impending disturbances, and takes actions to mitigate potential outages.

Impact to Homeland Security: This wide area measurement system (WAMS) provides the ability for system operators to view the stability of the grid in real time, calculate power transfer capabilities and limits in real time, and look beyond their own system to see conditions in neighboring systems to prepare for contingencies. The expected benefits are improved grid reliability, more efficient electricity markets, and increased system security. The August 14, 2003 blackout final report recommended the adoption of a WAMS to provide situational awareness both within and between neighboring systems. The economic cost of the August 14 blackout was estimated at between 4.5 and 10 billion dollars. Increased power transfer capability is worth hundreds of millions of dollars in economic market transactions as noted in the DOE's *National Transmission Grid Study*, May 2002. Security of the grid is enhanced by WAMS providing real time assessments of the locations where the grid is under stress and vulnerable, and by WAMS ability to detect, isolate, and limit grid disturbances, natural or deliberate. Finally, the monitoring and visualization Department of Energy, Office of Electric Transmission and Distribution

systems established by the project will be used as compliance monitoring tools for grid standards expected to be implemented with the passage of federal energy legislation.

Background/Problem: The U.S. transition to competitive electricity markets is causing the grid to be used in ways for which it was not designed, and the lack of economic incentives to build new transmission is creating overloads and increased grid congestion. Modernization of the grid can be accelerated by implementing state-of-the-art monitoring and control systems to gather real time data to expand and operate the grid efficiently while maintaining reliability and security. In addition to the reports mentioned above, the Draft *National Plan for Research and Development in Support of Critical Infrastructure Protection*, 2004, calls for “Developing a real-time, Global Positioning System (GPS)-synchronized wide-area measurement sensor system for electric grid monitoring and control” as one of the national R&D priorities.(page vi). This project is also identified in the plan as an ongoing DOE activity (page 7).

Related Efforts: The DOE Office of Electric Transmission and Distribution is working cooperatively with the Bonneville Power Administration (BPA) which is working with the Western Electricity Coordinating Council of NERC to develop the WAMS in the WECC. No other related efforts are underway in the Federal government.

Proposed Program 2005-2007 Research/Plan: DOE is supporting the EIPP by facilitating and organizing the activities of the Working Group, and its Task Teams that are focusing on implementation, software, standards, networking, and business issues. In addition, DOE research performers are assigned to participate in the working group and task teams directly to provide technical expertise in phasor measurement technologies and analysis tools. DOE along with BPA, WAPA, EPRI and the Bureau of Reclamation funded work in the Western interconnection in 1994 to initiate a similar WAMS. DOE is now working to coordinate Eastern and Western Interconnection WAMS efforts to share lessons learned, and to work jointly on issues that are common nationwide, such as standards and software development. DOE will also coordinate with the Electric Reliability Council of Texas (ERCOT).

The transmission utilities, ISOs, and RTOs are funding the installation of the measurement units, and associated data collection hardware, and communications systems. Vendors are actively participating in the EIPP Working Group, offering products and services for measurement equipment, servers, data handling, communications and analysis software.

Focusing on the Eastern Interconnection, the EIPP project is expected to have 50 phasor measurement units (PMU) operating in a network that extends from Louisiana to Ontario in FY05. One activity in FY05 will be to determine key locations on the grid to locate PMUs for full visibility of the grid without redundancy. This activity will pace future expansion, but current estimates foresee a total of 300 PMUs installed in the network in FY06. DOE involvement is expected to diminish as the electricity industry establishes the value of the WAMS for grid reliability and security, and market efficiency, and continues to expand the network.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: REAL TIME GRID RELIABILITY MANAGEMENT -
EASTERN INTERCONNECTION PHASOR PROJECT (EIPP)

AGENCY/DEPARTMENT: Department of Energy, Office of Electric Transmission
and Distribution

PRIMARY CONTACT PERSON: Philip Overholt, 202 586-8110

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To create a robust, widely available and secure synchronized data measurement infrastructure over the North American electric grid's Eastern interconnection with associated analysis and monitoring tools for better electric grid planning and operation, and enhanced reliability and security.

This project is a public/private partnership lead by the Department of Energy that includes major transmission utilities, Independent System Operators (ISO), Regional Transmission Organizations (RTO), equipment and software vendors, the North American Electric Reliability Council (NERC), and FERC in an EIPP Working Group. The goal of the project is to establish a real-time, GPS-synchronized, measurement network that will provide real time data to monitor and control the Nation's electric grid. Fundamental issues are optimal location of measurement units, data protocols, equipment and communications protocols and standards, and agreements for sharing data by utility participants. In addition to establishing the data collection network, the project task teams are defining visualization system needs, and system analysis software that runs on real time data inputs. The ultimate goal is to combine real time measurements with on-line analysis software to create an automatic, switchable electric grid that senses grid stress and impending disturbances, and takes actions to mitigate potential outages.

Impact to Homeland Security: This wide area measurement system (WAMS) provides the ability for system operators to view the stability of the grid in real time, calculate power transfer capabilities and limits in real time, and look beyond their own system to see conditions in neighboring systems to prepare for contingencies. The expected benefits are improved grid reliability, more efficient electricity markets, and increased system security. The August 14, 2003 blackout final report recommended the adoption of a WAMS to provide situational awareness both within and between neighboring systems. The economic cost of the August 14 blackout was estimated at between 4.5 and 10 billion dollars. Increased power transfer capability is worth hundreds of millions of dollars in economic market transactions as noted in the DOE's *National Transmission Grid Study*, May 2002. Security of the grid is enhanced by WAMS providing real time assessments of the locations where the grid is under stress and vulnerable, and by WAMS ability to detect, isolate, and limit grid disturbances, natural or deliberate. Finally, the monitoring and visualization

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TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: GEOLOGIC, HYDROLOGIC, BIOLOGIC, AND GEOGRAPHIC RESEARCH PROGRAMS

AGENCY/DEPARTMENT:U S Geological Survey/ DOI

PRIMARY CONTACT PERSON: James F. Devine

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *(limit to 150 words)*

The USGS accomplishes basic and applied research in geology, hydrology, biology and geography to provide: the science needed to support the sound management and conservation of the Nation's biological resources; objective reliable earth-science information on geologic hazards and resources and the Nation's geologic framework; the Nation's basic geospatial data ensuring access to and advancing the application of these data and other related earth science information for users world wide; the hydrologic information and understanding needed by others to achieve the best use and management of the Nation's water resources.

Impact to Homeland Security: *(What is the outcome? Money saved, lives saved, better protection, support prosecution or forensic investigation, etc.? limit to 150 words)*

All of these programs contribute to the understanding and protection of the Nation's infrastructure in a supporting capacity; e, g, the earthquake monitoring and research helps engineers, city planners and security plan and design structures and systems for withstand strong ground motion. Resource research and analyses contribute to the wise and economic use of the energy, minerals and ground and surface water. Understanding wildlife diseases can help in preventing their migration into the domestic food supplies. Finally, geospatial research can contribute to better decisions on land use , infrastructure location and protection.

Background/Problem: *(What is the fundamental issue? E.g., lack of standards for bio agent detection? Inadequate technology for ...? limit to 150 words)*

There exists today only limited understanding of many of the natural processes, such as climate change, earthquake fault location and potential for movement, water use and contamination, etc. Consequently, continued research in these areas is essential to confront evolving threats to the Nation's infrastructure.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

Proposed Program 2005-2007 Research/Plan:

U S Geological Survey/ DOI

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: DRINKING WATER AND WASTEWATER (WATER SECTOR) RESEARCH ACTIVITIES

AGENCY/DEPARTMENT: Environmental Protection Agency

PRIMARY CONTACT PEOPLE:

Jonathan Herrmann; 513-569-7839

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Curt Baranowski; 202-564-0636

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Program Status - Current and ongoing

Technical Program Objective(s):

The Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act) of 2002 is the legislative mandate for the U.S. Environmental Protection Agency's (EPA) work in water security. This law, coupled with executive directives and the Agency's own strategic plan for homeland security, guides the Agency's research and technical support activities to protect water infrastructure. The Homeland Security Presidential Directive on Critical Infrastructure Identification, Prioritization, and Protection (HSPD-7) reinforces EPA's role as the lead for water infrastructure. It also assigns the responsibility of coordinating the overall national effort to protect critical infrastructure and key resources of the U.S. to the Department of Homeland Security. As the federal lead for protecting the nation's drinking water and wastewater infrastructures, EPA plays a critical role in ensuring homeland security. To support these responsibilities, the Agency's Office of Water (OW) established the Water Protection Task Force. The Task Force was formally organized as the Water Security Division (WSD) in August 2003. The Agency's Office of Research and Development (ORD) officially established the National Homeland Security Research Center (NHSRC) in February 2003. These organizations work together in providing research and technical support to the drinking water and wastewater sectors. The NHSRC oversees three major research areas: Water Security, Rapid Risk Assessment, and Safe Buildings. NHSRC's Water Security Team contributes by conducting applied research and then reporting on ways to better secure the nation's water systems from threats and attacks. The Team is producing analytical tools and procedures, technology evaluations, models and methodologies, decontamination techniques, technical resource guides and protocols, and risk assessment methods. All of these products are for use by EPA's key water infrastructure customers — water utility operators, public health officials, and emergency and follow-up responders. WSD provides support to drinking water and wastewater systems by preparing vulnerability

Environmental Protection Agency

assessment and emergency response systems and tools, providing technical and financial assistance, and developing information exchange mechanisms.

WSD is also charged with supporting best security practices, providing security enhancement guidance, and incorporating security into the day-to-day operations of the drinking water and wastewater industries. In addition, WSD works closely with NHSRC in delivering research results in a timely and appropriate fashion. Along with providing research and technical support, both NHSRC and WSD encourage information sharing and risk communication strategies among key water infrastructure customers. This includes making use of the Water Information Sharing and Analysis Center (WaterISAC).

Impact to Homeland Security:

To better understand the security problems of the water industry in the U.S. EPA has engaged numerous water experts and stakeholders from government, industry, and academia. Other key participants are representatives from public health organizations, emergency responders and follow-up responders, law enforcement officials, environmental groups, and related professional associations. As a result of these meetings, EPA has gained valuable insights on the vulnerabilities and technical challenges facing the water industry for which research and technical support are crucial. With assistance from other federal agencies and contractors, both WSD and NHSRC are addressing these challenges. Issues, needs, and projects are summarized in the comprehensive Water Security Research and Technical Support Action Plan, hereafter referred to as the Action Plan. The Action Plan addresses drinking water supply, water treatment, finished water storage, and drinking water distribution system infrastructure. It also covers wastewater treatment and collection infrastructure, including sanitary and storm sewers or combined sanitary-storm sewer systems, wastewater treatment, and treated wastewater discharges. Much of the work described in the Action Plan has begun, and what is not underway will start over the next few months. The EPA is the designated lead federal agency for protecting the water sector, from source water through use, treatment, and discharge. Action Plan must, however, be recognized as a snapshot in time. As new information is developed on threats, contaminants, and threat situations, periodic revisions will be necessary.



Background/Problem:

Results from federal partner and water stakeholder meetings are organized in the *Action Plan* under the seven issues listed below. Each issue describes significant research needs with specific projects listed for each need. Although the *Action Plan* focuses primarily on biological, chemical, and radiological contaminants in drinking water systems, it also addresses physical and cyber threats, contingency planning, risk assessment, risk communication, and infrastructure interdependencies, as follows:

- Protecting drinking water systems from physical and cyber threats
- Identifying drinking water threats, contaminants, and threat scenarios
- Improving analytical methodologies and monitoring systems for drinking water
- Containing, treating, decontaminating, and disposing of contaminated water and materials
- Planning for contingencies and addressing infrastructure interdependencies
- Targeting effects on human health and informing the public about risks
- Protecting wastewater treatment and collection systems

How these issues are being addressed and the resulting products delivered are described below using the following approach:

- Enhancing collaborative research and technical support
- Providing for technology advancement through testing, evaluation, and verification
- Sharing information in both secure and open fashions

Key research and technical support needs identified by partners and stakeholders include the following:

- Ensure the protection of existing water infrastructure
- Enhance security against cyber attacks and other external means of disrupting water systems
- Identify and characterize threats that could be used to disrupt water systems
- Develop methods for detecting and monitoring contaminants in water
- Create rapid screening technologies for the identification of unknown contaminants
- Improve detectors and early warning systems for water distribution and collection systems
- Enhance models for contaminant transport in pipes and distribution systems
- Test and evaluate the performance of sensors and biomonitors
- Refine fate and transport information for contaminants in water
- Develop treatment or inactivation techniques for water contaminants
- Evaluate and improve decontamination and disposal techniques for contaminated materials and equipment
- Establish contingency planning and infrastructure backup
- Procedures Improve methods for assessing risks to the public from water contamination
- Enhance risk communication and information sharing among individuals and organizations dealing with a threat or attack



- Provide training and exercises that enhance preparedness, response, and mitigation to water system threats or attacks

Related Efforts:

In implementing its research the EPA has formed numerous collaborative agreements with private organizations and federal agencies with similar research interests and needs, which are as follows:

- In the field of physical and cyber protection EPA is engaged with the Army Corp of Engineers (ACOE) to identify physical countermeasures that can be used to minimize threats to water utilities and to develop voluntary design standards for new or retrofitted water and wastewater facilities. Similarly the Water Environment Research Foundation (WERF) is establishing minimum standards for computer systems used in water systems.
- The Departments of the Navy and Army are collaborating with EPA to understand the fate of biotoxins and biological organisms in water, to identify surrogates for highly toxic biological agents for use in research, and to develop analytical methods for the detection of biological agents and biotoxins in water.
- Detector technologies and early warning systems are being tested and evaluated by the Army's Edgewood Biological and Chemical Center (ECBC) as well as by the United State Geological Service (USGS). The testing at ECBC involves the use of a closed loop distribution system simulator located in a toxics chamber. Testing with select agents and other highly toxic materials can only be done in the highly controlled chamber environment.
- The Department of Energy's (DOE) National laboratories have unique capabilities with respect to software and specialized equipment fabrication. The national labs are contributing to the improvement of EPA-developed distribution system models to expand their applications to security related issues such as the determination of optimal monitoring locations, source identification and decontamination efficiency. The DOE's Idaho National Engineering Lab is taking lead on the development of specialized equipment to concentrate, by a factor of 400, water samples to enhance the detection of biological organisms.
- The National Institute of Standards and Technology (NIST), a federal agency within the U.S. Department of Commerce, is working to develop decontamination methods for a building's water supply lines and appliances.
- Information on the availability of alternate water supplies in a crisis situation is being evaluated by the ACOE. This study includes an evaluation of mobile treatment units, redundancies in existing treatment systems, and the locations and potential for cross



connections between water supplies. The study will culminate with a compendium of options for providing alternate water under varying situations.

- The National Science Foundation (NSF) is assisting EPA and its collaborators research efforts by providing continual evaluation of research needs and EPA's long-term priorities.

The Department of Homeland Security (DHS) is conducting research independent of EPA. These efforts include utilizing the National Labs to test security related technology, an approach similar to EPA's established Environmental Testing Verification (ETV) Program from which EPA has established an independent testing program for homeland security specific technologies.

Proposed Program 2005-2007 Research/Plan:

EPA has already begun projects to address key issues contained in the *Action Plan*, including the following:

- State-of-the-art review of early warning systems
 - Tracer studies guide for use at water utilities of various sizes
 - Treatability guide for biological contaminants in water
 - State-of-the-science review of emerging detection technologies for water contaminant
 - Performance review of routinely used water quality monitors
 - Case studies to assist in rapid access to alternative water sources
 - Preliminary framework for communicating threats and attacks on water systems
 - Tools to address water infrastructure interdependencies
 - State-of-the-science review of the impacts of biologically produced toxins on water systems
 - Protocols and devices to concentrate and analyze water for biological contaminants
 - Test matrix and state-of-the-knowledge technical reports on six biological/biochemical surrogates
 - Preliminary treatability database for treatment technique effectiveness in removing water contaminants
-
- Feasibility study for warnings and alerts based on public health surveillance reporting of disease indicators (syndromic surveillance)
 - Performance verifications of monitoring, treatment, and decontamination technologies' effectiveness

The challenges facing EPA in securing water infrastructure are interdependent and complex. The goal of the *Action Plan* is to provide useful and timely products to key water infrastructure customers that help protect drinking water and wastewater systems. To accomplish this goal, EPA is partnering with other federal agencies, national laboratories, non- governmental water industry research groups, and the private sector to build on



existing strengths, share the workload, and take advantage of related research already underway.

An example of such partnerships is the Distribution System Research Consortium formed by NHSRC and WSD. The consortium is comprised of 15 federal and non-federal organizations that meet twice a year to advance research and technical support focused on distribution systems. EPA's research and technical support activities will result in various types of products, tools, and technologies. These will be available to the water industry, public health officials, health care providers, and emergency responders, appointed and elected officials and others to aid in the fight against terrorism.

With a long history in environmental protection, including assessing, managing, and communicating risks, EPA is well positioned to develop tools and technologies that address potential attacks on drinking and waste water systems. The critical research described in the *Water Security Research and Technical Support Action Plan* will result in improved awareness, preparedness, prevention, response, and recovery from threats or attacks against water systems.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: GEO-SPATIAL ECONOMIC ANALYSIS

AGENCY/DEPARTMENT: Economic Research Service, U.S. Department of Agriculture

PRIMARY CONTACT PERSON: Greg Pompelli, 202-694-5353

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s):

The Geo-Spatial Economic Analysis (GSEA) system supports the economic analysis used to assess the cost of securing our food supply, and serves as platform for collaborative analysis on crop and animal disease mitigation strategies that require both sound scientific/biological and economic analysis. The system can be used to inform decision makers about the likely outcomes and costs of mitigation alternatives. This system can provide specific background information about food and agricultural production factors, and market characteristics that provide context and aid in the understanding of unfolding emergencies. For example, in the event of an animal disease outbreak anywhere in the United States, this system can be used to assess what at stake in terms of animal and farm numbers, affected businesses and the number of jobs that could be in jeopardy as a result of the event or mitigation efforts.

Impact to Homeland Security:

The GSEA system can be used to estimate the potential economic impact of events, accidental or intentional, that disrupted the production, processing, distribution or consumption of food and agricultural products. Using this analytical capability, the Department can contribute to homeland security exercises by estimating potential economic damages of security threats and the impacts of alternative responses. The system is designed as a comprehensive tool for assessing U.S. food system disruptions. This system is designed to distill tremendous amounts of information and to provide critical information that will enable decision makers take the actions needed to enhance food security, and limit economic damages. However, this system is not designed to replace the duties of agencies that are responsible for reacting to or preventing agricultural or food safety emergencies.

Background/Problem:

Timely answers to questions about the scope and context of agricultural and food sector events are vitally important in making decisions not only on response and recovery programs but also in providing the initial information needed for risk assessments and economic analyses of threat scenarios. The Department is fortunate to have a wealth of data that can Economic Research Service, U.S. Department of Agriculture

be used to inform decision making on security issues, and the GSEA system can be used to reduce the time needed to marshal that information. The GSEA system helps integrate data and analytical tools using existing technology and in consistent formats that reduce tedious data integration.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

Various agencies within the U.S. Department of Agriculture, including the Agricultural Research Service, Animal, Plant Health Inspection Service, Food Safety and Inspection Service, Agricultural Marketing Service, Farm Services Agency, and the Office of the Chief Economist are making significant homeland security contributions. The Department of Homeland Security has funded several Centers of Excellence that are working on animal diseases, food supply chains, and other risk assessments. The scientists in the National Labs at Sandia, Los Alamos, Lawrence Livermore, Oak Ridge and Argonne are actively involved in agricultural and food sector analysis.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

Database development efforts

-Improve current agricultural production database upon which epidemiological models or expert opinions can be used to quantify shocks thereby allowing us to translate and incorporate this into economic models.

-Expand trade database and improve tools for examining changes in trade patterns and volumes.

-Expanding database development – Who, what, where (both within the USDA and outside), including increased efforts to acquire field location data.

Analytical development efforts

-Improve links between and understanding of limits to standard economic models and modeling systems.

-Improve model integration with database information to better service internal research needs and needs of other agencies.

-Continued development of the Inter-Regional Input/Output (IRIO) model using U.S. Department of Commerce county-level data, includes efforts to integrate the IRIO model with other models and modeling systems, and test complementary strengths.

-Continue epidemiological model integration through related research projects.

-Initiate commodity transportation flow analysis research project with interested agencies and labs.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: ADAPTIVE QUARANTINE

AGENCY/DEPARTMENT: FAA/DOT

**PRIMARY CONTACT PERSON: Debra Herrmann, 202.385.8154,
Debra.herrmann@faa.gov**

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): Cyber security prevention, pre-emption, and preparedness are the impetus of this project. The goal is to provide an enterprise-wide capability to intercept a serious unfolding security event, thereby preventing disruption, compromise, or misappropriation of systems, networks, or information. The optimum solution for both safety/mission critical and mission support systems and networks is being determined. The risk of implementing an automated solution is being evaluated, as well as the risk of not taking (timely) action.

The name "Adaptive Quarantine" was chosen on purpose, since each response needs to adapt to the nature of the attack and the assets being attacked. There are two different quarantine scenarios. The first, or proactive, scenario temporarily isolates healthy system or network components or services to prevent them from becoming contaminated, corrupted, or compromised. The second, or reactive, scenario temporarily isolates sick system or network components or services to prevent them from contaminating, corrupting, or compromising healthy assets. Likewise, there are two dimensions to the quarantine challenge. The first dimension is the attack timeline. Proactive tools focus on pre-cursor events and pre-empting attacks. Reactive tools focus on responding to attacks after the fact. The second dimension is the protocol stack. Protection is needed at all seven layers of the ISO/OSI Technical Reference Model. Accordingly, an integrated solution is being pursued that includes a set of complementary products, each of which solves a different piece of the quarantine puzzle. A third aspect of this project is to develop a concept of operations that maps to the InfoCon Levels in FAA Order 1370.89 which correspond to the color-coded national threat levels; i.e. the configuration and operation of the integrated quarantine solution changes as the InfoCon Level increases.

Impact to Homeland Security: The outcome will be an integrated solution that is deployed to enhance the safety of the flying public and consistent availability of air transport by increasing the robustness and resilience of the IT infrastructure that comprises the nation's air traffic control and management systems. The solution is being developed for FAA's operational environment, which includes a heterogeneous mix of applications, operating systems, platforms, and networks (voice, radar, and data). However, since it consists of COTS products, the solution is equally applicable to any federal agency.

Background/Problem: A variety of federal, DOT, and FAA regulations and policies require an agency to have the capability to respond to security incidents, prevent disruption to normal operations, and isolate contaminated systems and networks. The challenge today, given zero day attacks, is that reactive capabilities and manual responses are severely inadequate. Automated responses that operate in milliseconds and emphasize pre-emption and prevention are needed. In essence, reactive signature and anomaly-based tools are becoming obsolete. Behavioral-based neural network tools that can pre-empt previously unknown types of attacks early in the attack timeline will be the key in the near future.

FAA must operate in an open environment; it cannot operate in a fortress and moat mode. Instead, given its mission FAA must readily exchange information with a variety of entities, like the airlines, general aviation, and civil aviation authorities around the world. Hence the need for robustness and resilience are paramount. Thirdly, federal agencies need to move away from a “box” mentality; no one product can secure an agency’s IT infrastructure. Rather, the focus should be on an integrated set of products that provide a comprehensive solution enterprise-wide.

Related Efforts: The DARPA Dynamic Quarantine initiative is the only other quarantine related research project of which we are aware within the federal government. This effort is concentrated on Internet worms, specifically zero day attacks, and specifies performance objectives for the response interval and maximum extent of assets infected.

In contrast, the scope of the FAA Adaptive Quarantine research project is larger. It encompasses all types of attacks (active and passive), all sources of attacks (Internet, non-Internet, insider, and outsider), and all layers of the protocol stack.

Proposed Program 2005-2007 Research/Plan:

2005

- Deploy reactive network-based tools
- Pilot test insider threat pre-emption
- Finalize recommendation for proactive network-based tools, with special emphasis on optimizing mix of insider versus outsider threat mitigation
- Draft common requirements and policy recommendations for a reactive server-based quarantine capability, which addresses custom and COTS applications, middleware, OS (and version specifics), and platform considerations.
- Identify an approach to providing a proactive server-based quarantine capability enterprise-wide in a heterogeneous operational environment.

2006

- Deploy proactive network-based tools

- Optimize integration of proactive and reactive network-based tools, in particular common reporting and management capabilities
- Increase granularity of quarantine capability. Goal is to quarantine the smallest asset space possible.
- Pilot test proactive server-based tools
- Finalize recommendations for reactive server-based quarantine capability.

2007

- Deploy proactive server-based tools
- Implement recommendations for reactive server-based quarantine capability
- Final tuning and optimization of enterprise-wide integrated solution

Note: Deployment will begin with the mission support systems and networks, then proceed to the safety/mission critical systems and networks.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: R&D FOR THE SECURITY OF HIGHWAY INFRASTRUCTURE

AGENCY/DEPARTMENT: Department of Transportation – Federal Highway Administration

PRIMARY CONTACT PERSON: Sheila Rimal Duwadi, 202-493-3106

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s):

The objective of the studies being conducted under this program are to develop a technical foundation for bridges, tunnels and other highway infrastructure, to support new technologies and improvements to codes, standards and practices to prevent and mitigate damages from malicious attacks and to reduce the impact of terrorism on highway infrastructure.

It is recognized that our highway system is vulnerable to terrorism. It can be used by terrorists as a means to carry out an attack through transport and delivery of weapons of mass destruction, and it is essential for emergency response personnel and for evacuation purposes after an attack.

The studies being conducted is an initial step in making our highway system less vulnerable to terrorism.

Impact to Homeland Security:

The outcome of these ongoing projects will assist the State Highway Agencies with sensing technologies, computer codes, structural hardening technologies, evacuation plans and procedures for mitigating against terrorism, for assisting emergency personnel to respond to, for evacuation, and for rapid repair and reconstruction if an event were to occur.

Our highway system is essential for national mobility and economic health. Our National Highway System carries 60% of all traffic and 80% of all truck traffic. Many of our bridges cross navigable waterways. Damage resulting from an attack could impede navigation in addition to disrupting vehicular or other lifeline traffic flows. Our highways transport hazardous materials. Approximately, 1.5 billion tons of hazardous material moves through our transportation system each year. Restricting the transport of these could severely disrupt our livelihood and cause other hardships.

Background/Problem:

Department of Transportation – Federal Highway Administration

Traditionally highway infrastructure has been designed to ensure safety of the traveling public from all hazards encountered on the roadway. This all-hazards approach has not however included terrorism. Today our bridges and structures are not designed for blast loadings, intentional impact, etc. associated with terrorism. There is a lack of validated design methodologies and approaches for designing for security, lack of risk assessment methodologies, and lack of rapid repair and restoration techniques. There is also a lack of traffic analysis tools for on-line traffic management and off-line traffic operations planning analyses to improve mobility and safety of the transportation network in times of national security. A comprehensive approach is required to address the R&D needs for security.

Related Efforts:

The FHWA under a cooperative agreement is working with the Army Corps of Engineers in several of the studies listed below. It is working with the State Department and the Secret Service in the development of security barriers. Additionally its research program is coordinated with those of the Transportation Research Board.

Ongoing Program:

State-of-the-Art Bridge Surveillance and Security Techniques

This study is synthesizing state-of-the-art practices related to surveillance and security of our bridge structures, and developing evaluation frameworks, tools, and techniques to select among alternative surveillance and security approaches that are consistent with vulnerability levels. This study will focus on surveillance component, which includes clear descriptions of systems that are available and their effectiveness, and security component, which includes strategies for managing surveillance information obtained, appropriate security responses, and security response costs.

Standardized Blast Response Curves for Bridges

This study is developing simple design aids to help engineers design bridges for blast loadings. The study will produce a standardized set of blast response curves for a generic set of common bridge elements to include: decks exposed to deck-top detonations; steel and pre-stressed girders exposed to deck-top detonations; rectangular and wall-type piers exposed to side-on detonations; and a single-cell tower of a cable-stayed bridge exposed to side-on deck-level detonations. For the generic elements, several different sizes, representing common bridge span ranges, will be included as well as bomb sizes ranging from 100- to 60,000 lbs. Three different damage levels will be addressed to include light-, moderate-, and heavy damage. The resulting data will be displayed in the form of Range-to-Effect Curves, i.e. the required threat standoff to prevent the maximum allowable level of damage vs. the explosive charge size.

Bridge-Specific Blast Loading Program

This study is developing a user-friendly computer program for consistent definition of blast loadings on bridges. The Army Corps of Engineers current computer program, titled

ConWep (Conventional Weapons Effects) is widely used within the engineering community to predict blast loadings on structures from conventional weapons, including terrorist-type vehicular bombs. Originally developed as an expedient and user-friendly tool for engineers concerned mostly with building structures, the Graphical-User-Interface (GUI) will be modified to better facilitate analysis of bridge-specific problems. It will develop a user-friendly and bridge-specific GUI for reliable definition of key parameters such as weapon size; weapon standoff; weapon orientation in relation to the structural element; the overall size of the structure, and the size of the responding element of interest.

Validation of Numerical Modeling and Analysis of Steel Bridge Towers Subjected to Blast Loadings

Although surveillance and security systems such as cameras and sensors can be used to deter and detect terrorists, in the end this might prove uneconomical and ineffective. It is also not practical to assume that society will be able to continuously inspect every truck that crosses these bridges. Building a strong structure, which can handle extreme event loadings, produces less chance of catastrophic failures and lessens the consequence of an event. There is a gap in the current knowledge of blast phenomenology associated with large explosive devices (truck bombs) detonated close-in or almost in contact with steel cellular structures, specifically bridge towers. This pooled fund study will develop several numerical models and analysis validated through the construction of physical models subjected to large explosive devices detonated to determine the actual behavior of such towers. This study will further develop and test several hardening concepts so that performance of these long span bridges can be well understood in the event of such an attack occurring after the hardening has been implemented.

Blast Testing of Full-Scale, Precast, Prestressed Concrete Girder Bridges

FHWA is participating in this pooled fund study led by and being proposed by the Washington State Department of Transportation. The objective of this research is: (1) to assess the damage done to precast, prestressed girder bridges from a blast generated below the girders, (2) to compare this damage with a blast generated on top of the bridge deck, and (3) to develop recommendations for possible mitigation measures that would harden this type of bridge blast damage. Two full-scale model bridges will be built to test blast effects. These bridges are similar to commonly constructed bridges in the United States. Both bridges will be four-girder bridges with one being 75 and the other being 150 feet long. The collected data will be reduced and used to formulate mathematical reproductions of the experienced forces and pressures for use in terrorism hardening of future designs and possible existing bridge retrofit schemes.

Development of Anti-Ram Safety Barriers

The FHWA, through the FHWA/NHTSA/George Washington University National Crash Analysis Center, has been conducting analysis and simulations to design various anti-ram barriers for the Department of State (DOS). The effort has been extended to evaluate the design of the bollards that were recently installed along 17th Street and on Pennsylvania Ave. in front of the White House. Current efforts involved analysis and design of a cable-based

system in front of a section of the Old Executive Office Building to meet the architectural desires of the National Capitol Planning Commission. The analysis and simulations will be completed using the DOS truck model and meeting their anti-ram criteria. The work is being done for the US Secret Service Agency by the FHWA Office of Federal Lands.
FHWA Contact for Barrier Design: Michael F. Trentacoste, (202) 493-3260

Proposed Program 2005-2007 Research/Plan:

Nothing to this section yet.

FOOD AND DRUG ADMINISTRATION (FOODS)

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: R&D FOR THE SECURITY AND SAFETY OF THE UNITED STATES FOOD SUPPLY (FDA REGULATED FOODS)

AGENCY/DEPARTMENT: Department of Health and Human Services, Food and Drug Administration, Center for Food Safety and Applied Nutrition

PRIMARY CONTACT PERSON: Dr. David Acheson, 301-436-1910

Program Status: X Current or ongoing Proposed

Technical Program Objective(s):

Goal: Develop effective protection strategies to "shield" the food supply from terrorist threats.

FDA's food safety and security research approach is threefold, involving an intramural program, an extramural program, and consortia with industry and/or academia. FDA conducts research that ensures food safety and food nutrition and the safety of cosmetic products. It is important that FDA conduct this research to ensure the health and well-being of the American public, to identify and eliminate foodborne dangers both naturally occurring and intentionally introduced into the food chain. The research provides the basis for identifying and countering foodborne pathogens, toxins, and selected agents. Just as important, the research provides the scientific basis for regulating the food producing industries to ensure a safe and nutritious food supply from farm to table.

Impact to Homeland Security: The principal purpose of this effort will be to establish guidelines and/or determine parameters (*e.g.*, time and temperature heat processing requirements to inactivate a threat agent in a food) for establishing shields and the inactivation of threat agents in high priority foods during periods of heightened alert. Additionally, these new methods will be utilized to detect and quantitate non-traditional foodborne agents (biological and chemical) in foods.

Background/Problem: The understanding of vulnerability assessments has allowed FDA to set appropriate research priorities amongst the myriad of potential food/select agent combinations. Based on this food defense threat assessment new microbiological, chemical, and radiological methods must be developed, validated, and used to detect, enumerate and identify potential non-traditional agents that may threaten the food supply. Additional assessments of the abilities of non-traditional microbial pathogens to survive and grow in foods during processing and storage, or the stability and activity of chemical agents while present in foods, and the potential for their inactivation during food processing are essential to improving FDA's ability to detect, quantitate and control foodborne pathogens, toxins and chemicals that threaten the food supply.

DEPARTMENT OF HEALTH AND HUMAN SERVICES, FOOD AND DRUG
ADMINISTRATION, CENTER FOR FOOD SAFETY AND APPLIED NUTRITION

Related Efforts: The Department of Agriculture, the Department of Homeland Security (through NBACC, the National Center for Food Protection and Defense, and other programs), and the Department of Defense have experience and related research endeavors in food defense.

Proposed Program 2005-2007 Research/Plan: Four general areas of research have been identified to support short term and long term improvements to reduce the vulnerability of foods to intentional contamination.

1. Prevention Technologies

Conduct research related to prevention technologies, neutralization techniques, tamper proof packaging, rapid methods and threat agent sensors. FDA studies food prevention technologies to improve the safety of food and establish guidelines and or performance standards for industry. Information is needed about new technologies and / or technology enhancements that can increase food safety and protect against potential exposure to non-traditional pathogens, toxins and chemicals during possible high threat situations.

Rationale: In the current classified food defense threat assessment document, there are about 30 priority threat agents (13 microbiological, 17 chemical) and 10 high priority foods. Using the existing threat assessment as a base, FDA will conduct 2 microbiological and 2 chemical prevention/mitigation research projects. Additionally, FDA proposed to issue competitive cooperative agreements and contracts for longer-term basic research goals that will contribute to this overarching prevention/mitigation focus, such as the development of in-line biosensors and nanotechnology-based detection systems that can be used in the plant processing environment.

2. Agent Characteristics

Conduct research on a number of biological and chemical threat agents to be evaluated by multiple, varied food processing techniques to determine the effect on persistence/survival of threat agents in the processing of food.

Rationale: FDA plans to examine 5 processing techniques (*e.g.*, pasteurization, high-pressure, canning), 10 high priority foods, and 5 threat agents, which would be $5 \times 10 \times 5 = 250$ threat agent characteristics research projects.

3. New Methods

Conduct research to develop and evaluate detection methods for threat agent/food combinations. FDA fulfills its responsibility for ensuring the defense of the food supply through reliance on surveillance and monitoring methods. New microbiological, chemical, and radiological methods must be developed, validated, and used to detect, enumerate and identify potential non-traditional agents that may threaten the food supply.

Rationale: Using the existing threat assessment as a base, FDA will conduct 8 microbiological and 13 chemical methods development research projects in FY2004-2005. These methods will include screening methods to be used for domestic and import surveillance and laboratory-based confirmatory methods. Using the current threat assessment, the effort involves $30 \text{ threat agents} \times 10 \text{ high priority foods} \times 2 \text{ method types (screening and confirmatory)} = 600$ total methods. Additionally, FDA will be supporting its

intramural microbial forensics research program (in the context of detection techniques) in collaboration with the FBI, CIA, and DHS.

4. Dose Response Relationships

Conduct research related to oral infectious dose of specific select agents associated with food matrices. An understanding of the dosage amounts needed to inflict human disease or produce adverse reactions, where exposure occurs through consumption of different food matrices, is essential to accurately estimate the threat posed by such exposures. In turn, knowledge of dose response helps determine methods development performance parameters (e.g., sensitivity, ruggedness, statistical confidence) that assure safety and defense of the food supply.

Additional Program/Efforts

The research plan also includes radionuclide agents. The principal effort involves the development of a transportable system for radionuclide analysis in FDA regulated foods. Specific activities include the set up, calibration, testing, and writing of supporting documentation for a transportable radionuclide analysis system for quantitative analysis of gamma-emitters and qualitative analysis of alpha- and beta-emitters. The system will be used to augment FDA's existing radioanalytical capabilities, for training, for evaluation of FDA's radiological emergency response plans, and for radiological monitoring.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: NATIONAL COOPERATIVE HIGHWAY
RESEARCH PROGRAM

AGENCY/DEPARTMENT: Transportation Research Board
National Academy of Sciences

PRIMARY CONTACT PERSON: Stephan Parker, Transportation Research Board
(202) 334-2554

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s):

The National Cooperative Highway Research Program (NCHRP) was created in 1962 as a means to conduct research in acute problem areas that affect highway planning, design, construction, operation, and maintenance nationwide. This program is administered by the [Transportation Research Board](#) (TRB) and sponsored by the member departments (i.e., individual state departments of transportation) of the [American Association of State Highway and Transportation Officials \(AASHTO\)](#), in cooperation with the [Federal Highway Administration](#) (FHWA).

The National Cooperative Highway Research Program has budgeted \$5.925 million in FY 2002 through FY 2005 for security-related research. Obligations amount to \$5.815 million to date. The AASHTO Special Committee on Transportation Security provides steering direction to the coordinated Cooperative Research Programs Security Research under NCHRP and the Transit Cooperative Research Program (TCRP). A technical panel provides oversight and project selection guidance for NCHRP through Project Panel 20-59, Surface Transportation Security Research. The research efforts completed or underway are designed to address state DOT needs across a wide range of issues, including awareness, resource needs, long range program strategies, transportation system operations in emergencies, emergency response planning and communications, continuity of operations, CBRN response options, risk assessment methodologies, structural hardening,

Impact to Homeland Security:

As noted above, the intended outcome of these efforts is to provide timely and authoritative information to state DOTs as they work to identify their critical transportation infrastructure and develop appropriate security plans that cover the full range of needs from emergency response planning and preparedness, risk assessment, countermeasure identification and implementation, effective response, recovery, and rapid restoration of vital services. State highway departments are in many cases "first responders" at the scene of incidents,

Transportation Research Board/National Academy of Sciences

accidents, as well as natural and man-made catastrophic events. Training and equipping their forces to deal with natural and man-made incidents can and does save lives as well as reduce the impact of those events on highway users and the public in general. As owners of critical infrastructure, they are responsible for the provision of critical transportation services and would have to shoulder the financial burden of an attack on their facilities. Therefore, these efforts are designed to develop cost effective security enhancement strategies for states to use in developing a transportation security program tailored to their individual needs and public policies.

Background/Problem:

Products of and current work of the NCHRP Security Research Program includes the following:

- A Guide to Updating Highway Emergency Response Plans for Terrorist Attacks
- A Guide to Highway Vulnerability Assessments
- A Guide to Risk Management of Multi-modal Transportation Infrastructure
- Blue Ribbon Panel Study and Report on Transportation Security Needs
- National Needs Assessment for Ensuring Transportation Infrastructure Security
- State DOT Field Personnel Security Manual and associated training materials
- Methods for Determining Transportation and Economic Consequences of Terrorist Attacks
- Secure Communications Infrastructure
- Enhanced Communications Interoperability – An Assessment of Emerging Voice/Data Integration Tools
- Emergency Traffic Operations Management
- Transportation Agency Continuity of Operations Plans
- Guidelines for Emergency Quarantine Closures of Local Roads

Related Efforts:

As noted in the first section, there is a companion Transit Cooperative Research Program underway under the administration of the Transportation Research Board. That effort has produced a number of very noteworthy reports and guides for the transit industry, some of which were jointly sponsored with the NCHRP Security Research panel. The Federal Transit Administration would be the best source of information on this effort.

Proposed Program 2005-2007 Research/Plan:

The AASHTO Special Committee on Transportation Security is currently developing a long-range plan to guide the NCHRP security research program. That long-range program will continue to address the broad array of needs from emergency response planning and implementation, risk assessment, countermeasure development and implementation – including decision-making tools for resource allocation, recovery and rapid restoration of services.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: VULNERABILITY OF TANK CARS TO SMALL ARMS FIRE

AGENCY/DEPARTMENT: Federal Railroad Administration, Department of Transportation

PRIMARY CONTACT PERSON: Shahram (Sean) Mehrvarzi

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To provide technical knowledge of the effects of small arms fire on tank cars and to determine methods to stop leaks. In addition, methods to detect small arms fire impacting the tank car were evaluated. A two-phased test program was initiated.

The primary objective of Phase A is to evaluate the response of the accelerometers and hydrophone transducers to structural excitation events common in the normal railroad operating environment at different speeds increments (10 mph to maximum allowable for the tank car). The objectives of Phase B are twofold: to develop emergency response techniques and procedures to plug punctures in pressure tank cars caused by small arms (5.56mm- 50 cal.). Once technique(s) have been determined by testing to be successful, then a training curriculum, appropriate props, emergency response protocol, and possibly specialized tools, are to be developed to train emergency responders.

Impact to Homeland Security: With the development of accurate monitoring devices, an incident of small arms puncture of the tank car can be identified and notification of the incident made to the locomotive engineer and others, such as dispatchers, emergency response personnel and security personnel.

With proper training and tank car plugging devices, a breach of a tank car can be mitigated.

Background/Problem: During industry-sponsored tests performed in November of 2001 the Association of American Railroads proved that loaded pressure tank cars are subject to breaching by small arms fire (5.56mm – 50 cal.) at relatively long distances (500 to 1,000 meters). As a result of these tests AAR and contractors have examined various methods to “harden” tank cars. All of the options to “armor” tank cars available with today’s technology are either too heavy or so expensive as to be economically impractical.

Finding that hardening tank cars is impractical, the AAR proposed to the Department of Homeland Security’s Infrastructure Protection Division to develop emergency response techniques and procedures to plug punctures in pressure tank cars containing hazardous materials caused by small arms

: Federal Railroad Administration, Department of Transportation

As part of this proposal several meetings were held with Subject Matter Experts from the railroads, emergency responders, chemical shippers, tank car manufactures, trade associations, and emergency response contractors to develop patching devices and protocols.

After development and fabrication of tools, the Subject Matter Experts gathered in Pueblo, CO to test the tool(s) and response technique(s) on actual tank cars loaded with water and pressurized with air. The cars were punctured by small caliber ammunition and the Subject Matter Experts attempted to verify that the proposed tool(s) and technique(s) work properly. All response work was filmed for later evaluation.

Related Efforts: *N/A*

Proposed Program 2005-2007 Research/Plan: Plans for FY 2005 depend on the outcome of analysis of the test results. Investigation of the hydrophones will continue as part of the program to identify impacts on tank cars carrying hazardous materials.

: Federal Railroad Administration, Department of Transportation

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: R&D TO SUPPORT DEVELOPMENT OF A RAILROAD SYSTEM SECURITY DESIGN GUIDELINE HANDBOOK

AGENCY/DEPARTMENT: Equipment and Operating Practices Research Division, Office of Research & Development, Federal Railroad Administration, U.S. Department of Transportation

PRIMARY CONTACT PERSON: Sean Mehrvarzi, (202) 493-6108

Program Status: ☐ Current or ongoing ☒ Proposed

Technical Program Objective(s):

To develop commuter/passenger rail security design guidelines/considerations that would enhance the detection, deterrence, mitigation of consequences, and the response to terrorist attacks. Identify likely terrorist attack scenarios and railroad vulnerabilities, research and design technological enhancements, and develop planning and deployment approaches for implementing comprehensive mitigation strategies. Identify industry experts who would be invited to participate in technical working groups to review and provide guidance on possible design considerations.

A handbook of planning and design guidelines for commuter/passenger rail operating agencies to consider/apply as they develop scalable strategies for hardening their systems against terrorist attacks. The design guidelines will be developed and presented in the context of the commuter/passenger rail operating environments. The handbook will address technology “fixes”, which could be applied as part of strategies to detect, prevent, minimize, respond and recover from attacks. The guidance will be practical and realistic from the standpoint of implementation and cost.

Impact to Homeland Security:

This program would meet the following DOT Strategic Goals and Outcomes; Security – helping to reduce the vulnerability of the commuter rail infrastructure to consequences of intentional harm to the system, its employees and its users and Mobility – raising the public's confidence in the security of commuter rail and increasing public use of commuter rail.

Background/Problem:

The project would result in design guidelines and mitigation strategies that focus on:

- Hardening of commuter rail cars by original equipment manufacturers;

: Federal Railroad Administration, Department of Transportation

- Retrofitting of existing rail cars to detect, prevent and minimize the consequences of terrorist attacks;
- Hardening system-wide infrastructure whether it is for new construction or part of structural rehabs;
- Implementing access management and credentialing policies, technologies and techniques;
- Establishing requisites for building an integrated system for the real time exchange of information within a commuter rail systems and with emergency responders; and
- Developing communication protocol requirements for improving internal and external interoperability, particularly during emergencies.

The handbook would also include practical tools or checklists for commuter/passenger railroads to use in the development of security plans and the deployment of strategies.

Related Efforts:

This work would capitalize on current research that is being conducted for the Federal Transit Administration.

Proposed Program 2005-2007 Research/Plan:

A security design guidelines handbook project is currently being developed for the FTA. This effort would build upon the work already completed for the FTA handbook. Additional research would be conducted regarding likely threats and vulnerabilities, and to identify commuter rail elements for which additional considerations/guidelines would be needed. At the same time, consideration will be given to improving public awareness, developing training and technical assistance and improving emergency response and recovery activities.

- Phase I - Preliminary Assessment – Six month timeframe
 - Literature search
 - Interviews
 - Technology investigations
 - Likely threats and vulnerabilities
 - Draft Phase I Report
 - Working group reviews
 - Final Phase I Report
- Phase II – Development of Guidelines - one year timeframe
 - Guidelines/considerations draft chapters on:
 - Rail cars

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- Infrastructure
 - Communications
 - Systems integration
 - Access management and credentialing
 - Working group reviews
 - Final Phase II Reports
- Phase III – Development of Outreach Approach- Six month timeframe
 - Handbook format (hardcopy, electronic, etc.)
 - Toolkit and checklist preparation
 - Distribution
 - Training approaches/strategies

Funding: \$650,000 for two years

Phase I : Preliminary Assessment: \$ 150 K (FY '05)
Phases II: Development of Guidelines: \$ 400 K (FY '06)
Phases III: Development of Outreach Approach \$ 100 K (FY '07)

: Federal Railroad Administration, Department of Transportation

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: VULNERABILITY OF RAIL PASSENGER CARS TO EXPLOSIVE EVENTS

AGENCY/DEPARTMENT: Federal Railroad Administration, Department of Transportation

PRIMARY CONTACT PERSON: Shahram (Sean) Mehrvarzi

Program Status: ☐ Current or ongoing ☒ Proposed

Technical Program Objective(s): To provide technical knowledge of the effects of explosions on a rail passenger car both from within a passenger rail car and from outside the car. Another objective is to determine the effects of a passenger car explosion on surrounding structures such as terminals, track, bridges and tunnels.

Impact to Homeland Security: Knowledge of the effects of an explosive event both within and beside a rail passenger car will aid emergency responders and security personnel.

Background/Problem: Based on the recent events in Madrid and Moscow, there is the possibility of passenger cars being used as a terrorist target in the United States. Rail passenger cars in the U.S. are structurally different from those in the Madrid and Moscow incidents. Therefore, it is necessary to determine the effects of a bomb placed within a passenger car and also the vulnerability of a passenger rail car to an explosion beside it. The infrastructure around the rail passenger car is also susceptible to the blast effects.

Related Efforts: Work at NIST on building explosive effects may be useful in this effort.

Proposed Program 2005-2007 Research/Plan: In FY 2005, FRA plans to work with the Association of American Railroads and with passenger railroads to develop a test plan and conduct a test of a rail passenger car to a variety of explosive devices. The actual tests may continue into FY 2006.

: Federal Railroad Administration, Department of Transportation

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: RAIL INFRASTRUCTURE SECURITY AND TRESPASS MONITORING PROJECT IN PITTSFORD, NEW YORK

AGENCY/DEPARTMENT: Equipment and Operating Practices Research Division, Office of Research & Development, Federal Railroad Administration, U.S. Department of Transportation

PRIMARY CONTACT PERSON: Sean Mehrvarzi, (202) 493-6108

PROGRAM STATUS: ☒ CURRENT OR ONGOING ☐ PROPOSED

Technical Program Objective(s):

To demonstrate a video-based monitoring system that has the capability of detecting trespassers when they intrude onto the railroad right-of-way or bridge. The video system monitors the apertures of the trestle bridge entrances that correspond to the railroad ROW. The system has the capability to alert the staff at the security company, who then analyze the nature of the situation and take the appropriate action(s). Such actions may include using a public address system to warn the trespasser(s) and/or notifying the local and railroad police. The methodology used is a before and after trespass violation count. This system was used to monitor the number of trespass events for the first year to establish a baseline, "before" condition. The "after" condition data collection is complete and a report is currently in development. This supports the development of performance specifications as the last phase of this project.

Impact to Homeland Security:

Trespass fatalities have been holding steady at an average of just over 500 per year over the past several years. The trespass problem actually surpassed the highway-rail grade crossing problem in 1996. Potential benefits can be calculated by estimating the number of lives that were potentially saved due to the presence of the prototype railroad infrastructure security system. If the system functioned properly and the trespassers obeyed the warning to leave the bridge just prior to a train arrival, it could be argued that lives have been saved. At least two events in which a total of four trespassers were removed from the bridge just minutes from a train arrival occurred during the first two-year period. The potential benefits gained from the use of this prototype system can be stated as being "up to four lives or serious injuries saved in two years", based on the two "close-call" events.

Background/Problem:

: Federal Railroad Administration, Department of Transportation

This research project has demonstrated and evaluated a stand-alone video-based trespass monitoring and deterrent system for railroad infrastructure applications using commercial off-the-shelf (COTS) technology. The major constraints were that the system could not tie into any track circuitry and that it also had to be located out of the railroad's right-of-way. These restrictions prevented the usage of track-running signals as well as mounting equipment on the bridge. The system was installed in August of 2001, just before the terrorist attacks on the United States. It should be noted that there were significantly less security options available before the attacks. The options were extensively researched and a potential system was configured.

Related Efforts: None

Proposed Program 2005-2007 Research/Plan:

A number of issues have been identified throughout the design, installation, and evaluation process. Some concerns have forced re-designing and fine-tuning parts of the system while others caused changes in the evaluation scope. Future activities will include:

- Further fine-tuning of the components
- Research into new technologies
- Research into security-related modifications and applications

Phase I: Design, Purchase & Equipment installation - Complete

Phases II: Data Collection - Complete

Phase III: Equipment teardown and report generation.....\$ 100,000

This research task will provide an evaluation and discussion of operational and communication issues of the prototype system installed on a trestle over the Erie Canal in Pittsford, New York.

Phase IV: Research state-of-the art components to upgrade/supplement the current configuration and develop performance guidelines for a rail infrastructure security and trespass monitoring system and in addition to include the physical infrastructure security option.....\$ 150,000

: Federal Railroad Administration, Department of Transportation

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: TRANSPORTATION SECURITY SITUATION DISPLAY (TSSD)

AGENCY/DEPARTMENT: Equipment and Operating Practices Research Division, Office of Research & Development, Federal Railroad Administration, U.S. Department of Transportation

PRIMARY CONTACT PERSON: Sean Mehrvarzi, (202) 493-6108

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): The TSSD is a prototype graphical display of real-time and archived data. It aims to provide scalable situational awareness and decision support for a range of activities. Along with the display of physical transportation networks, TSSD will show traffic flows, real-time weather and satellite imagery, intelligent alarm systems, and data from other types of intelligent transportation and environmental remote sensors. The TSSD also plans to incorporate data from GPS-based systems, population, demographics, locations of first responders, medical facilities, and engineering data on buildings. Later, it will include modeling and simulation capabilities for plume dispersion, spills, traffic, bio-surveillance and tracking of disease via transportation vectors. Initial test sites are in Boston and New York City. The NYC Office of Emergency Management (OEM) is a partner in the development effort, as is Silicon Graphics, Incorporated (SGI) through a Cooperative Research and Development Agreement (CRADA).

Impact to Homeland Security: TSSD development addresses the vulnerabilities and response capabilities in matters of homeland security, natural disasters, and weather-caused disruptions. The system will improve the ability of DOT to provide effective emergency transportation responses based on the risk and consequences of death, injury, and property damage. Overlays of exposure information such as census data, labor force characteristics, petroleum storage facilities, and commodity flows would show the potential societal and economic impacts of an event.

Hazardous materials carried by rail could be targeted by terrorists to release poisonous gases, therefore, accurate real-time meteorological data are essential for initializing plume dispersion models, and predicting the downwind effects to exposed populations and businesses. Site specific information on chemical manufacturing, distribution, and end-user facilities could be retrieved and integrated with satellite imagery, live camera feeds, and other

: Federal Railroad Administration, Department of Transportation

types of data that would show rail operators and emergency responders the relative proximity of events and fixed assets.

Background/Problem: Vulnerabilities in emergency response and transportation sometimes occur during natural disasters. Present tools are inadequate for simultaneously solving the human decision-maker problems of information access, situational awareness, and resource allocation by application of multiple levels of information technology for planning and operational management at local and regional scales. The TSSD provides a decision support system that is multi-modal, crosscutting, broad scale, interactive, and technically advanced.

As a specific case, New York City experienced two major terrorist attacks over the past dozen years and remains a potential target. It is also susceptible to natural disasters such as winter storms, severe thunderstorms, and floods. Along with local trucking activity, several railroads transport large amounts of HAZMAT within the city. The complex transportation, jurisdictional, economic, and emergency response environment provides a challenging location for developing the TSSD and testing innovative approaches to monitor, deter, or mitigate the impacts of terrorist and natural events.

Related Efforts: Other types of data fusion and display activities and communication and collaboration technologies are in development elsewhere. The Department of Homeland Security (DHS) Regional Technology Integration (RTI) initiative, for example, has provided grants to create interoperable communication systems in Anaheim, CA and Cincinnati, OH. The Defense Threat Reduction Agency (DTRA) has also sponsored similar activities. The DHS/U.S. Coast Guard is developing a Marine Domain Awareness (MDA) program that proposes an integrated network of surveillance and sensor equipment in coastal locations. The USGS is developing the National Map, a multi-agency effort to enhance the ability to access, integrate, and apply geospatial data at global, national, and local scales.

Proposed Program 2005-2007 Research/Plan: A substantial part of the TSSD program for 2005-2007 will focus on the objectives of a recent grant awarded to the OEM by the U.S. Department of Commerce, National Telecommunications Information Administration (NTIA), and Technology Opportunities Program (TOP). The TOP grant application submitted by the OEM specified a major role for the U.S. DOT/Research and Special Programs Administration's Volpe Center,

point of contact is Michael Rossetti in support of the FRA, in the proposed set of activities in the area of public safety. The project is further supported by a CRADA between the Volpe Center and SGI. The TOP grant calls for the integration of the following types of real-time data into the NYC test site: traffic cameras, weather information, aviation, trucking, and railroads. These data will be superimposed onto a geospatial base map that includes high-resolution, 3D, urban imagery for lower Manhattan, such as data that describe the transportation infrastructure, population and demographics, industrial and manufacturing

: Federal Railroad Administration, Department of Transportation

activity, and other critical infrastructures such as police and fire departments, hospitals, schools, and similar information.

The project also allows for the simulation of potential adverse events such as severe weather, or the accidental or intentional release of hazardous materials. This may involve the testing of micrometeorological models and atmospheric transport and diffusion models in order to better understand and prepare for their circumstances and consequences. The TSSD also emphasizes the use of digital data communications, message switching, automated notifications, and surveillance and sensors that will benefit public safety, and create more efficient and interoperable networks for emergency planning and response capabilities.

Emerging opportunities include building upon on previous work on Liquefied Natural Gas (LNG) scenarios and exposures, integration of incident management system and Loran/GPS experiment, reconciliation with 9/11 Commission Report, real-time data acquisition and assimilation of aviation data, maritime data, road traffic/ITS generated data sets, dispersion and noise models and scenario analysis, acquisition and testing of models, atmospheric transport and dispersion, noise contour, epidemiological/transportation, hydrological, and hazmat tracking/scenarios using vehicle tracking technology.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: TRANSPORTATION INFRASTRUCTURE ASSURANCE TASK ON STRATEGIES FOR BIODEFENSE PREPAREDNESS AND RECOVERY

AGENCY/DEPARTMENT: DOT/RSPA Volpe Center (performing organization) for the DOT Research and Special Programs Administration (RSPA) (sponsor)

PRIMARY CONTACT PERSON: Dr. Aviva Brecher, 617-494-3470

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): The key objective is to develop a well- organized, user-friendly and current web resource with information resources for transportation stakeholders at all levels. The website will be designed to inform, assist in preparing for and appropriately respond to a bioattack against transportation targets, focusing on decontamination and recovery. The website, currently under development, is tailored to the needs of transportation authorities at federal, state and local levels, including owners and operators of transportation facilities or systems. The Biodefense Resources for Transportation website will consist of an annotated bibliography with hotlinks, to be hosted by the Volpe Center for RSPA and modeled on the Transportation Emergency Management website at http://www.rspa.dot.gov/oet/tem_library.html or subsites of the DOT Science and Technology website <http://scitech.dot.gov>

Impact to Homeland Security: The project will support the DHS/TSA and FEMA in their emergency management and recovery objectives, and help return the vital transportation to normal state of operational readiness. It will contribute by helping transportation stakeholders address a largely neglected area of the aftermath of a bioattack, and strategies to marshal both financial and human resources for an effective cleanup effort, as well as plan for materials and logistics for cleanup suited to the bioagent and to the contaminated facilities, vehicles and equipment. A key issue is to determine when the cleaned up facility is safe enough, in order to reassure both workers and travelers that normal travel operations can be resumed.

Background/Problem: Currently, the most dreaded scenario by transportation agencies and public health and homeland security coordinators, is the prospect of bioterrorism involving major transportation targets, like airports or transit terminals, and/ or conveyances like aircraft and cruise ship. Reliable and timely open-source information is needed on biodefense strategies, bioagent detectors

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and proven or certified cleanup materials and procedures. The information needed by transportation officials is currently both fragmented and confused. Especially needed for planning and preparedness are credible cost and duration estimates for post-attack decontamination of transportation terminals and vehicles. Compared to the cleanup costs associated with the 2001 anthrax attacks, an attack involving a contagious agent such as smallpox or plague, would impose a large cost burden, and shut down locally and regionally and for indeterminate periods the transportation network, with likely national and global impacts. Such impacts would impede the rapid arrival of first responders to the bioattack site, the distribution of first aid and food or supplies, and the timely evacuation of ill personnel and travelers or bystanders. A bio-attack, if involving a contagious agent (smallpox, plague) might spread disease and panic nationwide or globally, and result in a long-duration shut down of multiple, interlinked transportation nodes depending on whether public health response requires quarantine or evacuation. Transportation shutdowns would impede the rapid arrival of first responders to the bioattack site, the distribution of first aid and food or supplies, and the timely evacuation of ill personnel and travelers or bystanders. Furthermore, until and unless the nature, location and extent of bioagent contamination can be accurately determined, the temporal and financial costs of cleanup and recovery are both unclear and unknown. Therefore, the Volpe Center was tasked to evaluate, sort and organize technical literature resources, including studies and guidelines developed by the National Labs, federal agencies, the National Academies, academia, professional associations and consultants or commercial business.

This effort takes advantage of several Volpe Center symposia and previous projects summarized in the Volpe Journal special issue on Transportation and Security posted at <http://www.volpe.dot.gov/infosrc/journal/2003/index.html> and of information collected as part of a March, 2004 outreach event on Decontamination and Recovery after Bioattack, posted at <http://www.volpe.dot.gov/ourwork/dimensions/workshops.html>

Related Efforts: The National Academy Of Sciences (NAS) Transportation Research Board (TRB) Committee on Critical Infrastructure Protection maintains a resource subsite on Transportation System Security, to be monitored. The Livermore and Sandia National Laboratories are performing for DHS Restoration Domestic Demonstration and Application program (DDAP research on modeling, simulation and training for reclaiming contaminated airports and other transportation facilities. The EPA Homeland Security Research Efforts, such as the recent workshop on the Transportation and Disposal of Contaminated wastes and its Building Decontamination Technology Center are also of immediate relevance.

Proposed Program 2005-2007 Research/Plan: A beta version of the website will be posted in early CY05, with a hotlink to the Volpe Center to facilitate user feedback. Upgrades and maintenance to include transportation-specific resources on bioterrorism will be provided quarterly (if funded) through FY05-06.

A major aspect for FY05 upgrade will be to review and reference the findings of ongoing NAS projects on "Standards and Policies for Decontaminating Public Transportation

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Facilities Affected by exposure to Harmful biological Agents: How Clean is Safe?,” in view of the fact that cleanup agents are themselves toxic; and related NAS studies, e.g., the “Review of EPA Homeland Security Efforts: Safe Buildings program Research implementation Plan”, which emphasizes decontamination and disposal aspects; and “Review of Testing and Evaluation Methodology for Biological Point Detectors.”

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: LORAN AS A TIMING BACKUP TO GPS

AGENCY/DEPARTMENT: Volpe Center (performing org.), Research and Special Programs Administration (sponsoring org.), U.S. Department of Transportation.

PRIMARY CONTACT PERSON: James Carroll, 617-494-2908

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): The project objectives are twofold. First, there will be an assessment of the feasibility of an enhanced Loran-C to serve as a backup signal in urban surface transportation. Second, there will be an evaluation of Loran-C as a timing backup for GPS. Over the last two decades, the U.S. Department of Transportation's Volpe Center has developed and evolved a series of technology advances in vehicle/fleet tracking and management, along with a number of associated applications. As part of the ongoing evaluation and modernization of the Loran radionavigation system, the Center and the FAA have discussed a project that would showcase the capabilities of an enhanced Loran (*eLoran*) to potential multi-modal civil users. Volpe plans to address the safety, security, and associated economic continuity benefits that may result from using an *eLoran*-enabled tracking infrastructure – in particular, *eLoran*'s value as an equivalent, backup tracking and timing signal for users of the GPS.

Impact to Homeland Security: The project assesses the role of the Loran signal for timing applications, the vulnerabilities of GPS, and the development of a terrestrial backup system for homeland security and other applications. Project activities could meet the needs of a wide range of users in transportation modes, and provide specific operational and security capabilities. The vehicle tracking system has the ability to monitor the movement of large numbers of diverse vehicles – even within “urban canyons,” where unaided GPS performance can be unreliable. Other potential users of mobile sensor platforms moving randomly about a city could include monitoring of air quality, temperature, pollen, hazardous substances (nuclear, biological, chemical), etc. The ability to display information on a mobile network would only be limited by the availability and installation of an appropriate mix of sensors for each specific use, and design and implementation of the backbone communications network and command and control applications.

Background/Problem: Recent advances in fleet tracking and management technologies now make it feasible to demonstrate their use in applications within large urban areas. A key feature in the development process has been the recent introduction of technology that integrates *eLoran* with GPS, thus helping to overcome GPS signal blocking that can occur in

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the urban canyon, or potential accidental or intentional signal disruptions. Because of the diverse nature of the *eLoran* system, it can supplement and backup GPS, greatly enhancing system availability, and continuity of service. The *eLoran* signal is virtually immune to signal blockage by buildings and foliage.

At the heart of each tracking system is a transponder, a dual (GPS – *eLoran*) navigation system, and a two-way digital wireless data link to a command center placed in each asset. The transponder broadcasts relevant data about the transponder-equipped assets (marine vessels, land vehicles, or aircraft) to a command center, where the data are organized and presented in a manner that facilitates timely and effective decision-making and provides information to support trend-based analyses to support strategic planning and policy decisions

Related Efforts: Similar tracking systems have been maritime interests. These included the Automatic Identification System (AIS) and the Vessel Information and Positioning System (VIPS). Typical applications include vessel traffic management and optimizing the flow of vessels in constricted waterways. For aviation, the Volpe Center has also developed the Enhanced Traffic Management System (ETMS), a real-time tracking and information display of traffic in the National Airspace System.

Proposed Program 2005-2007 Research/Plan: The Volpe Center surveillance and tracking system is now being set up to measure and compare Loran-C and GPS timing recovery. Test platforms are now being completely configured, and it is expected that specific timing and frequency testing can begin soon. The New York City Office of Emergency Management has expressed interest in serving as a test site for this technology. Tests are expected to commence during the December 2004 to January 2005 time frame.

The Volpe Center has also developed the capability to evaluate enhanced Loran-C as a timing backup to GPS and independent cesium clocks. To date, a Loran-C site area monitor (SAM) has been established at the Center. The SAM gathers and generates data that enables precision time recovery from the Loran signal. Data are then used to characterize Loran signal anomalies with sufficient precision to improve timing performance from about 100 nanoseconds to about 50. The timing has a direct navigation benefit in producing a Loran “differential” correction with enough accuracy to locate vehicles on roadways, and to meet accuracy requirements for maritime harbor entrance and approach.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: TRANSPORTATION RESPONSE OPTIONS: SCENARIOS OF INFECTIOUS DISEASE, BIOLOGICAL AGENTS, RADIOLOGICAL, CHEMICAL AND OTHER HAZARDOUS MATERIALS: A GUIDE TO TRANSPORTATION'S ROLE IN PUBLIC HEALTH DISASTERS

AGENCY/DEPARTMENT: DOT/Office of Emergency Transportation (OET)

PRIMARY CONTACT PERSON: Roger Bohnert, DOT/RSPA/OET (Ruth A. Hunter, RSPA/Volpe Center)

Program Status: X Current or ongoing ___ Proposed

Technical Program Objective(s): Building on recommendations from its "Transportation Issues in Bioterrorism" workshop, DOT/OET partnered with the Transportation Research Board (TRB) National Cooperative Highway Research Program (NCHRP) in examining the responses to a biological, chemical, or radiological release that are available to transportation systems and associated impacts on public health, safety, local economy and other transportation modes. TRB is funding a project is entitled "Transportation Response Options: Scenarios of Infectious Disease, Biological Agents, Radiological, Chemical and Other Hazardous Materials: A Guide to Transportation's Role in Public Health Disasters," to develop technical materials for the joint effort. Volpe's role is to aid OET in disseminating appropriate derivative information, primarily to state transportation officials for their use in advising emergency response decision makers. The research objective is to provide guidance for state and local transportation officials' use in the development and communication of transportation response options and impacts within an incident management system.

Impact to Homeland Security: Effective use of transportation systems during an incident for disaster response support (including evacuation and shelter-in-place) without unduly disrupting unaffected areas, populace, and economic activity. Better understanding by state and local officials of inter-relatedness and complexity of transportation systems, its response capabilities and limitations, and potential adverse impact of some emergency decisions on the broader intermodal transportation network. This activity is being coordinated with

Background/Problem: State officials on the TRB committee stated the need for succinct materials that would enable them to communicate with incident managers about the capabilities and limitations of the transportation system, the impact of local or regional emergency incident response decisions on the intermodal transportation system, and potential related economic effects.

Related Efforts: Coordinating effort with DOT/Federal Highway Administration (FHWA) and AASHTO (American Association of State Highway and Transportation Officials).

Proposed Program 2005-2007 Research/Plan: N/A

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: VULNERABILITY OF PORT CHANNELS TO STOPPAGE OF VESSELS BECAUSE OF BROKEN MOORINGS

AGENCY/DEPARTMENT: Maritime Administration, Department of Transportation

PRIMARY CONTACT PERSON: Alex Landsburg, 202-366-1923

Program Status: ☐ Current or ongoing ☒ Proposed

Technical Program Objective(s): To provide technical knowledge, analytical tools, and best practices to prevent vessels from being pulled off of their moorings because of the effects of a vessel being brought into the harbor at higher than normal harbor speeds.

Impact to Homeland Security: Breaking of the moorings for ships loading and unloading cargo in harbors can result in serious problems and ultimately the shut down of traffic in and out of the harbor for a lengthy time.

Background/Problem: Recent studies have shown that routinely, ships are pulled away from their moorings by the passing of large ships in narrow harbor channels. The passing ships provide large suction forces on the moored ships. Part of the problem is technical in the assessment of how strong these forces are and part of the problem is operational and providing for regular monitoring of the moorings to assure there is no slack present when large ships pass.

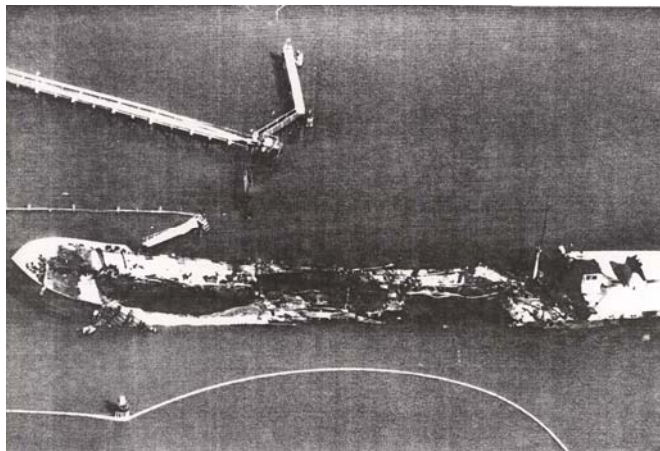


Fig. 1 Tanker Jupiter was destroyed in a fire after being pulled off of its moorings by a passing ship, Seelig [2001]

It has also recently been found that smaller but high-speed vessels can create large waves that can break the cable/lines used in normal mooring arrangements. A U.S. Navy high-speed vessel being tested recently passed by a number of MARAD vessels in permanent

Maritime Administration, Department of Transportation

moorings and broke 12 steel cables requiring the rethinking of how the mooring was done. Tools to analyze the forces on moored ships from ships passing by have recently been shown to predict inaccurately forces when studies using Computational Fluid Dynamics (CFD) tools have been applied to studying some harbor design alternatives.

Related Efforts: The Society of Naval Architects and Marine Engineers has a low level project underway to pull together best practices and provide an introduction to the tools currently available for analyzing mooring forces. This project will provide Harbor Safety Committees around the nation with basic information that will help improve operational practices.

Proposed Program 2005-2007 Research/Plan: Survey the particular operational practices used in different ports and by ship owners who decide what lines and cables to use for their vessels. In addition, survey ship terminals for the specific requirements they often impose on vessels. Apply CFD analysis tools to identify systematically the correct parameters to be utilized in simpler analytical tools for ship owners, terminal operators, pilots organizations, harbor safety committees, and by mariners in their practice. Determine approaches to applying safety margins to mooring analyses to determine requirements that will provide the added safety against the risk from terrorist actions involving the movement of large or high-speed ships in harbor situations to effect the shut down of movement of cargo through the port.

Reference

Seelig, William N., 2001, "Passing Ship Effects on Moored Ships", NFESC Technical Report TR-6027-OCN.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: EMERGENCY SUPPORT FUNCTION #1 CRITICAL INFRASTRUCTURE MODELING TOOL FOR INCIDENT AND MILITARY DEPLOYMENT PLANNING, TRAINING, AND RECOVERY

AGENCY/DEPARTMENT: Maritime Administration, Department of Transportation

PRIMARY CONTACT PERSON: Bill Aird, 202-366-1901

Program Status: ☐ Current or ongoing ☒ Proposed

Technical Program Objective(s):

Develop robust transportation system modeling capability using the Department of Transportation (DOT) Federal Highway Administration's (FHWA's) Freight Analysis Framework (FAF) platform. The enhanced model would include air, rail, highway, pipeline, and maritime infrastructure together with current and projected freight and passenger flows. The GIS based model would provide DOT with a modeling capability that would be used to assist the Department of Homeland Security (DHS), Federal Emergency Management Agency and Transportation Security Administration (TSA) in decision making necessary to reestablishing and recovering the freight and passenger vehicle flows after a critical infrastructure incident or military deployment. The tool would help identify, prioritize, coordinate, and focus recovery efforts by Federal, State, local governments and private sector. The model would support the National Response Plans and DOT's Emergency Support Function #1 mission. A timely recovery of a disrupted transportation system or critical transportation asset will minimize the impact of the disruption and damage to the economy and public morale and confidence.

Impact to Homeland Security:

The modeling capability will provide the ability to remove critical infrastructure, model the size and extent of the disruption (cargo, trucks, and passenger car), and identify workarounds to recover the transportation system. The model will be flexible and allow the removal of different amounts of infrastructure (bridge to port area) for varying lengths of time. This capability will reduce disruption costs, recovery time and cost, save lives. A timely recovery will improve public morale and confidence.

Background/Problem:

The FHWA FAF platform has been focused primarily on highway related modeling and disruption planning. This GIS modeling tool needs to be moved to the DOT Crisis Management Center and expanded to include all infrastructure modes and freight passenger flow. The expanded program needs additional funding. The technology is available but the model development and data support is expensive. The FHWA FAF website is located at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm

Related Efforts:

Maritime Administration, Department of Transportation

FHWA is continuing to support the current FAF.

Proposed Program 2005-2007 Research/Plan:

A robust comprehensive model would provide DOT with a decision tool that the Secretary of Transportation could use in helping recovery the transportation system after an incident in support of the DOT missions, the National Response Plan, and DOT's Emergency Support Function #1. Modeling would allow contingency planning and the adjustment of traffic flows after critical infrastructure is removed by a terrorist event or natural disaster. TSA has the lead for the recovery of the transportation system after a terrorist incident but DOT should have transportation modeling capabilities to support TSA in this area. DOT should be fully equipped to provide the subject matter expertise on transportation system recoveries.

FHWA manages and supports the FAF program but it does not include all modes. The FAF is expensive to develop and maintain, and primarily focuses on FHWA highway system and truck flows. The FAF needs to be expanded to include maritime assets and terminal flows, etc. A model could be used for military deployment modeling and exercises.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: PROTECTION OF U.S. MANUFACTURING FACILITIES FROM SHUTDOWN BECAUSE OF DELAY IN DELIVERY OF MANUFACTURING COMPONENTS

AGENCY/DEPARTMENT: Maritime Administration, Department of Transportation

PRIMARY CONTACT PERSON: Alex Landsburg, (202) 366-1923

PROGRAM STATUS: ☐ CURRENT OR ONGOING ☒ PROPOSED

Technical Program Objective(s):

Identify weak links in the supply chain infrastructure for key manufacturing plants for components/materials; analyze alternative delivery options when maritime disruptions occur; determine impacts on production because of delays and economic and other consequences to the nation; and formulate both short and long-term policy changes and system improvements necessary to enable lower levels of risk.

Impact to Homeland Security:

The impact from the inability for a ship to unload in a port and the alternative arrangements and the ultimate delay in delivery of cargo to destination manufacturing plants that results can be very significant. Because of reliability of transportation logistics and competition, very small numbers of components are stockpiled to account for possible delay in deliveries to prevent the necessity of shutting down a production line.

to deliver cargo to destination manufacturing plants

Homeland security is very much tied to the ability of our manufacturing resources to produce needed items for defense and maintain a strong economy. A month or two of delay would easily occur because of an obstruction in a major port that would result in very significant delays from rerouting of ships and cargo through other routs. A great number of manufacturing plants would have to shut down until deliver of components because these components are no longer stockpiled. The potential impact is currently very significant and would wreak great havoc on the nation's economy.

Background/Problem:

Because of reliability and service improvements, most manufacturing plants in the world have moved to "Just in Time" delivery of components to minimize the cost of storage and wastage. Deliveries of components sometimes taking a month or more of transportation through the different transportation modes (ship, train, truck, etc.) are highly reliable. This creates a very serious problem for a manufacturing facility when delivery of any of the components is delayed past the amounts of the item that are stockpiled to prevent this situation from occurring. T

Maritime Administration, Department of Transportation

A slowdown of cargo through the Port of Long Beach/Los Angeles where 50 percent of the nation's cargo enters would cause very significant delays in delivery affecting manufacturing plants all across the country. Closure of the harbor due to a ship blocking an entrance waterway to a port would require rerouting of vessels for a likely period of six months or longer because of the time required for salvage of ships in such a situation. Contingencies for such occurrences need to be reviewed and the delivery delays examined with a longer term view of how to improve the flexibility of the nation's transportation system to lower the risk of shutting down critical manufacturing entities for significant periods and resultant economic effects on the economy.

Related Efforts: None known.

Proposed Program 2005-2007 Research/Plan:

Identify a number of critical manufacturing entities in different locations. Study component delivery logistics chains and rerouting alternatives for the more serious delay situations and determine expected magnitudes of impacts. Review the possible Federal Government incentives that could be applied to lower the risk of impacts. Look for near and long term solutions that can be applied with a view to application in the variety of situations that exist.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: ADAPTIVE QUARANTINE

AGENCY/DEPARTMENT: Federal Aviation Administration/Department of Transportation

PRIMARY CONTACT PERSON: Debra Herrmann, 202.385.8154,
Debra.herrmann@faa.gov

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): Cyber security prevention, pre-emption, and preparedness are the impetus of this project. The goal is to provide an enterprise-wide capability to intercept a serious unfolding security event, thereby preventing disruption, compromise, or misappropriation of systems, networks, or information. The optimum solution for both safety/mission critical and mission support systems and networks is being determined. The risk of implementing an automated solution is being evaluated, as well as the risk of not taking (timely) action.

The name "Adaptive Quarantine" was chosen on purpose, since each response needs to adapt to the nature of the attack and the assets being attacked. There are two different quarantine scenarios. The first, or proactive, scenario temporarily isolates healthy system or network components or services to prevent them from becoming contaminated, corrupted, or compromised. The second, or reactive, scenario temporarily isolates sick system or network components or services to prevent them from contaminating, corrupting, or compromising healthy assets. Likewise, there are two dimensions to the quarantine challenge. The first dimension is the attack timeline. Proactive tools focus on pre-cursor events and pre-empting attacks. Reactive tools focus on responding to attacks after the fact. The second dimension is the protocol stack. Protection is needed at all seven layers of the ISO/OSI Technical Reference Model. Accordingly, an integrated solution is being pursued that includes a set of complementary products, each of which solves a different piece of the quarantine puzzle. A third aspect of this project is to develop a concept of operations that maps to the InfoCon Levels in FAA Order 1370.89 which correspond to the color-coded national threat levels; i.e. the configuration and operation of the integrated quarantine solution changes as the InfoCon Level increases.

Impact to Homeland Security: The outcome will be an integrated solution that is deployed to enhance the safety of the flying public and consistent availability of air transport by increasing the robustness and resilience of the IT infrastructure that comprises the nation's air traffic control and management systems. The solution is being developed for FAA's operational environment, which includes a heterogeneous mix of applications, operating systems, platforms, and networks (voice, radar, and data). However, since it consists of COTS products, the solution is equally applicable to any federal agency.

Federal Aviation Administration/Department of Transportation

Background/Problem: A variety of federal, DOT, and FAA regulations and policies require an agency to have the capability to respond to security incidents, prevent disruption to normal operations, and isolate contaminated systems and networks. The challenge today, given zero day attacks, is that reactive capabilities and manual responses are severely inadequate. Automated responses that operate in milliseconds and emphasize pre-emption and prevention are needed. In essence, reactive signature and anomaly-based tools are becoming obsolete. Behavioral-based neural network tools that can pre-empt previously unknown types of attacks early in the attack timeline will be the key in the near future.

FAA must operate in an open environment; it cannot operate in a fortress and moat mode. Instead, given its mission FAA must readily exchange information with a variety of entities, like the airlines, general aviation, and civil aviation authorities around the world. Hence the need for robustness and resilience are paramount. Thirdly, federal agencies need to move away from a “box” mentality; no one product can secure an agency’s IT infrastructure. Rather, the focus should be on an integrated set of products that provide a comprehensive solution enterprise-wide.

Related Efforts: The DARPA Dynamic Quarantine initiative is the only other quarantine related research project of which we are aware within the federal government. This effort is concentrated on Internet worms, specifically zero day attacks, and specifies performance objectives for the response interval and maximum extent of assets infected.

In contrast, the scope of the FAA Adaptive Quarantine research project is larger. It encompasses all types of attacks (active and passive), all sources of attacks (Internet, non-Internet, insider, and outsider), and all layers of the protocol stack.

Proposed Program 2005-2007 Research/Plan:

2005

- Deploy reactive network-based tools
- Pilot test insider threat pre-emption
- Finalize recommendation for proactive network-based tools, with special emphasis on optimizing mix of insider versus outsider threat mitigation
- Draft common requirements and policy recommendations for a reactive server-based quarantine capability, which addresses custom and COTS applications, middleware, OS (and version specifics), and platform considerations.
- Identify an approach to providing a proactive server-based quarantine capability enterprise-wide in a heterogeneous operational environment.

2006

- Deploy proactive network-based tools

- Optimize integration of proactive and reactive network-based tools, in particular common reporting and management capabilities
- Increase granularity of quarantine capability. Goal is to quarantine the smallest asset space possible.
- Pilot test proactive server-based tools
- Finalize recommendations for reactive server-based quarantine capability.

2007

- Deploy proactive server-based tools
- Implement recommendations for reactive server-based quarantine capability
- Final tuning and optimization of enterprise-wide integrated solution

Note: Deployment will begin with the mission support systems and networks, then proceed to the safety/mission critical systems and networks.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: IMPROVED SITUATIONAL AWARENESS FOR INFRASTRUCTURE PROTECTION: SENSING, IMAGING, AND COMMUNICATIONS

AGENCY/DEPARTMENT: NIST Electromagnetics Division 818

PRIMARY CONTACT PERSON:

Dr. Dennis Friday, Chief: friday@boulder.nist.gov, 303-497-3131

Dr. Kate A. Remley, Division Technical Liaison: remley@boulder.nist.gov, 303-497-3652

NIST Electromagnetics Division 818

Program Status: ___ Current or ongoing ___**x** Proposed

Technical Program Objective(s): *(limit to 150 words)*

NIST's Electromagnetics Division proposes to apply its broad range of technical expertise to critical infrastructure protection by developing and supporting forward-looking situational awareness technologies. Specific technologies where NIST can have a significant impact include imaging, sensing, communications, materials characterization, advanced materials development, and threat assessment, as detailed below. NIST's role will include development of prototype technologies, generation of measurement-based and theoretical models, new test and measurement methods, and generation of technical data. NIST is uniquely able to provide technical guidance and unbiased evaluation of new and existing technologies in support of critical infrastructure protection.

Impact to Homeland Security: *(What is the outcome? Money saved, lives saved, better protection, support prosecution or forensic investigation, etc.? limit to 150 words)*

Improved knowledge of obstacles, weapons, and other threats will allow first responders and others involved in infrastructure protection to carry out their missions more efficiently, accurately, and safely. NIST's laboratories and expertise will be utilized to develop technology aimed at improving awareness of threats to our first responder community and to the nation's critical infrastructure.

As next generation sensing, imaging, and detection technologies are developed, it is essential that accurate, unbiased assessments are carried out. NIST's unique role as the nation's measurement laboratory ensures that these new technologies will perform as desired when deployed.

Background/Problem: *(What is the fundamental issue? E.g., lack of standards for bio agent detection? Inadequate technology for ...? limit to 150 words)*

As discussed in the NCIP R&D Plan, situational awareness is vital to assure security for the nation's physical infrastructure systems. Electromagnetics plays a key role in many aspects of situational awareness including sensing, imaging, communications, materials characterization, vulnerability testing, tampering detection, and next-generation materials development. NIST research in the above areas can directly impact preparedness.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

NIST's Electromagnetics Division has world-class expertise in measurement science and technology development. Our long-standing programs in RF Fields, RF Electronics, and Magnetics provide an unparalleled depth of experience and breadth of knowledge.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The Electromagnetics Division has an array of proposals in support of situational awareness for critical infrastructure protection. More details can be supplied by request on the titles listed below and on related topics.

TITLE: IMPROVISED ARRAYS FOR FIRST RESPONDERS IN CRISIS SITUATIONS

TITLE: MICROWAVE CAT IMAGING SYSTEM FOR RAPID PERSONNEL SCREENING

TITLE: CARBON NANOTUBE-COATED TM₁₁₀ CIRCULAR DISK RESONATORS FOR WIRELESS MICROWAVE REMOTE SENSING OF PATHOGENIC CHEMICAL AND BIOLOGIC MATERIALS

TITLE: RADIO DIRECTION FINDING IN AN URBAN ENVIRONMENT

TITLE: DETECTION OF ELECTRONIC BOMB-DETONATORS

TITLE: SYSTEM EFFECTS DUE TO RF WEAPON DEVICES

TITLE: IMPROVISED ANTENNA ARRAYS FOR COMMUNICATIONS AND INTELLIGENCE ACQUISITION

TITLE: WIDE-BAND CHARACTERIZATION OF THE DIELECTRIC PROPERTIES OF BUILDING MATERIALS

TITLE: HIGH-SPEED BIOCHIP DESIGNS AND MEASUREMENTS

TITLE: CHARACTERIZING THE VULNERABILITY OF AIRCRAFT, VEHICLES, AND OTHER SENSITIVE VOLUMES TO HIGH-INTENSITY ELECTROMAGNETIC FIELDS

TITLE: MOBILE, REMOTE SENSOR COMMUNICATIONS IN HAZARDOUS ENVIRONMENTS

TITLE: REFERENCE DATABASE FOR ELECTROMAGNETIC PROPERTIES OF MATERIALS FOR IMPROVED METAL-DETECTOR DESIGN AND PERFORMANCE VALIDATION

TITLE: CONCEALED WEAPON AND EXPLOSIVES DETECTION USING MICROWAVE AND MILLIMETER-WAVE REFLECTION

TITLE: IMPROVED WIRELESS SYSTEMS VIA NEW NONLINEAR MEASUREMENT CAPABILITY

TITLE: TECHNOLOGY-ENABLING CALIBRATION AND MEASUREMENT SERVICES

TITLE: IMPROVEMENT OF UNCERTAINTIES FOR MICROWAVE REMOTE SENSING

TITLE: CHARACTERIZATION OF LOW-NOISE AMPLIFIERS (LNAs)

TITLE: RADAR CROSS SECTION STANDARDS AND MEASUREMENTS

TITLE: RADIO-WAVE PROPAGATION IN COLLAPSED BUILDING SCENARIOS

TITLE: FIELD MAPPING OF RADIO SIGNALS IN LARGE PUBLIC BUILDINGS

TITLE: WEAK-SIGNAL DETECTION FOR FIRST RESPONDERS

TITLE: THZ IMAGING AND SPECTROSCOPY OF BIOLOGIC AND PHYSICAL THREAT AGENTS

TITLE: 400-GHZ PULSED SPECTROSCOPY

TITLE: CHARACTERIZATION OF ELECTRONICS WITH 100-GHZ CLOCK RATE

TITLE: HIGH SENSITIVITY, LOW FIELD MAGNETIC SENSORS

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: IMPROVED SITUATIONAL AWARENESS FOR INFRASTRUCTURE PROTECTION: SENSING, IMAGING, AND COMMUNICATIONS

AGENCY/DEPARTMENT: NIST Electromagnetics Division 818

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NIST Electromagnetics Division 818

Program Status: ☐ Current or ongoing ☒ Proposed

Technical Program Objective(s): *(limit to 150 words)*

NIST's Electromagnetics Division proposes to apply its broad range of technical expertise to critical infrastructure protection by developing and supporting forward-looking situational awareness technologies. Specific technologies where NIST can have a significant impact include imaging, sensing, communications, materials characterization, advanced materials development, and threat assessment, as detailed below. NIST's role will include development of prototype technologies, generation of measurement-based and theoretical models, new test and measurement methods, and generation of technical data. NIST is uniquely able to provide technical guidance and unbiased evaluation of new and existing technologies in support of critical infrastructure protection.

Impact to Homeland Security: *(What is the outcome? Money saved, lives saved, better protection, support prosecution or forensic investigation, etc.? limit to 150 words)*

Improved knowledge of obstacles, weapons, and other threats will allow first responders and others involved in infrastructure protection to carry out their missions more efficiently, accurately, and safely. NIST's laboratories and expertise will be utilized to develop technology aimed at improving awareness of threats to our first responder community and to the nation's critical infrastructure.

As next generation sensing, imaging, and detection technologies are developed, it is essential that accurate, unbiased assessments are carried out. NIST's unique role as the nation's measurement laboratory ensures that these new technologies will perform as desired when deployed.

Background/Problem: *(What is the fundamental issue? E.g., lack of standards for bio agent detection? Inadequate technology for ...? limit to 150 words)*

As discussed in the NCIP R&D Plan, situational awareness is vital to assure security for the nation's physical infrastructure systems. Electromagnetics plays a key role in many aspects of situational awareness including sensing, imaging, communications, materials characterization, vulnerability testing, tampering detection, and next-generation materials development. NIST research in the above areas can directly impact preparedness.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

NIST's Electromagnetics Division has world-class expertise in measurement science and technology development. Our long-standing programs in RF Fields, RF Electronics, and Magnetics provide an unparalleled depth of experience and breadth of knowledge.

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The Electromagnetics Division has an array of proposals in support of situational awareness for critical infrastructure protection. More details can be supplied by request on the titles listed below and on related topics.

TITLE: IMPROVISED ARRAYS FOR FIRST RESPONDERS IN CRISIS SITUATIONS

TITLE: MICROWAVE CAT IMAGING SYSTEM FOR RAPID PERSONNEL SCREENING

TITLE: CARBON NANOTUBE-COATED TM₁₁₀ CIRCULAR DISK RESONATORS FOR WIRELESS MICROWAVE REMOTE SENSING OF PATHOGENIC CHEMICAL AND BIOLOGIC MATERIALS

TITLE: RADIO DIRECTION FINDING IN AN URBAN ENVIRONMENT

TITLE: DETECTION OF ELECTRONIC BOMB-DETONATORS

TITLE: SYSTEM EFFECTS DUE TO RF WEAPON DEVICES

TITLE: IMPROVISED ANTENNA ARRAYS FOR COMMUNICATIONS AND INTELLIGENCE ACQUISITION

TITLE: WIDE-BAND CHARACTERIZATION OF THE DIELECTRIC PROPERTIES OF BUILDING MATERIALS

TITLE: HIGH-SPEED BIOCHIP DESIGNS AND MEASUREMENTS

TITLE: CHARACTERIZING THE VULNERABILITY OF AIRCRAFT, VEHICLES, AND OTHER SENSITIVE VOLUMES TO HIGH-INTENSITY ELECTROMAGNETIC FIELDS

TITLE: MOBILE, REMOTE SENSOR COMMUNICATIONS IN HAZARDOUS ENVIRONMENTS

TITLE: REFERENCE DATABASE FOR ELECTROMAGNETIC PROPERTIES OF MATERIALS FOR IMPROVED METAL-DETECTOR DESIGN AND PERFORMANCE VALIDATION

TITLE: CONCEALED WEAPON AND EXPLOSIVES DETECTION USING MICROWAVE AND MILLIMETER-WAVE REFLECTION

TITLE: IMPROVED WIRELESS SYSTEMS VIA NEW NONLINEAR MEASUREMENT CAPABILITY

TITLE: TECHNOLOGY-ENABLING CALIBRATION AND MEASUREMENT SERVICES

TITLE: IMPROVEMENT OF UNCERTAINTIES FOR MICROWAVE REMOTE SENSING

TITLE: CHARACTERIZATION OF LOW-NOISE AMPLIFIERS (LNAs)

TITLE: RADAR CROSS SECTION STANDARDS AND MEASUREMENTS

TITLE: RADIO-WAVE PROPAGATION IN COLLAPSED BUILDING SCENARIOS

TITLE: FIELD MAPPING OF RADIO SIGNALS IN LARGE PUBLIC BUILDINGS

TITLE: WEAK-SIGNAL DETECTION FOR FIRST RESPONDERS

TITLE: THZ IMAGING AND SPECTROSCOPY OF BIOLOGIC AND PHYSICAL THREAT AGENTS

TITLE: 400-GHZ PULSED SPECTROSCOPY

TITLE: CHARACTERIZATION OF ELECTRONICS WITH 100-GHZ CLOCK RATE

TITLE: HIGH SENSITIVITY, LOW FIELD MAGNETIC SENSORS

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: *SEAMLESS EXCHANGE OF PROPERTY DATA FOR EFFECTIVE THREAT RESPONSE*

AGENCY/DEPARTMENT: NIST

PRIMARY CONTACT PERSON: Gregory J. Rosasco

Program Status: ☐ Current or ongoing ☒ **Proposed**

Technical Program Objective(s): *Extend and develop data exchange standards, interoperable information technology, and conformity testing methodology to allow effective federation of all data archives that must be accessed to provide, on demand, the physical and chemical property data required for the protection of critical infrastructure. This proposal addresses the fact that physical and chemical properties are the information about potentially damaging substances that is required to understand the risks to, and develop protection strategies for, physical infrastructure.*

The proposed program seeks collaboratively to harmonize data specifications, integrate data resources, and assure interoperability collaboratively with DHS, DoE, DoT, EPA, NATO, OSHA and DoD as well as those from industry organizations such as, NFPA, ACC, SOCMA, NACD, CCPS, AIHA, ASSE, etc., and similar international organizations.

Impact to Homeland Security: *Homeland Security depends at its most elemental level on knowledge that enables anticipating, understanding, and being prepared (prevention or mitigation) for threats. The proposed effort will provide a path to rapid and trustworthy access to the knowledge base of physical and chemical properties required for enhanced security with a particular emphasis on the potential for infrastructure damage associated with chemical agents.*

Background/Problem: *Knowledge of the physical and chemical properties (physical phase, liquid viscosity, vapor pressure, solubility, reactivity, stability-risk of explosion, corrosion potential, etc.) of a threat agent is critical for protection of physical infrastructure. Sources of such data are widely dispersed across organizations and agencies (National, International, Federal, State, and local), specialized scientific and engineering disciplines, and industries (chemicals, power, electrical, transportation, etc). The data generally are maintained in legacy archives, in media and formats incompatible with effective searching and retrieval, not documented as to content and quality, and interpretable only by experts in a specialized domain. This situation creates large barriers to effective retrieval and utilization of these vital but disparate data resources. The technology and standards infrastructure facilitating data retrieval, exchange, and utilization is emerging in the area of physical and chemical property data and can effectively be advanced and deployed to integrate vital resources into the homeland security infrastructure.*

Related Efforts: *For over a decade, NIST has worked with U.S. industry and national and international standards organizations in developing the standards and information technology to facilitate operations in the globally distributed, heterogeneous-resource environment characteristic of today's enterprises. These programs continue to expand to address these issues for the complete range of data and information that need to be integrated seamlessly into modern enterprise management systems. In the area of physical and chemical properties, the NIST Chemical Science and Technology Laboratory is participating in the development of a large range of internationally accepted data exchange standards, for example: chemical analysis instrumentation (AnIML), spectroscopic data (SpectroML), physical property data (ThermoML), and an unambiguous, searchable indexing scheme for chemical substances, the IUPAC-NIST Chemical Identifier.*

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

FY2005: *In collaboration with DHS identify the scope of data important to Critical Infrastructure Protection. This would include, for example, ranges of substances, conditions, and required physical and chemical properties. Also in collaboration with DHS identify highest priority data users in the CIP arena: first responders, detection/mitigation research and development, threat evaluation, etc. Work with the selected users to identify and prioritize application requirements specific to their domain. Identify sources for all data within the initial scope defined by DHS and characterize existing data formats, storage and access modalities, domain specific standards and application scenarios.*

FY2006: *Convene workshops with domain experts in each area identified by DHS (in year 1) as important to Critical Infrastructure Protection, create action teams with embedded NIST experts and initiate development of semantics, syntax and schema describing domain specific data. Identify existing inter-domain exchange channels, any supporting infrastructure, and interoperability requirements. Map interdependencies and hierarchies for information exchange and interoperability across all domains within the CIP enterprise. Identify all data exchange and interoperability gaps within the CIP enterprise.*

FY2007: *Convene selected members from each domain action team, the domain-specific NIST experts, and internationally recognized leaders in the enterprise integration field to create a preliminary model and approach to establishing, maintaining, and enabling extensions of the infrastructure for data integration and knowledge management of physical and chemical property data across the CIP enterprise. Form and enable teams of public/private partners to create the information technology systems necessary to establish and operate the information networks and knowledge management systems supporting the physical and chemical property data needs for CIP enterprise.*

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: National Institute of Standards and Technology Radiation and Nuclear Standards Program for Homeland Security

AGENCY/DEPARTMENT: DoC-NIST

PRIMARY CONTACT PERSON: Lisa R. Karam (301-975-5561;
lisa.karam@nist.gov

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *(limit to 150 words)* The objectives of this project include the development of National standards for homeland security radioactivity and radiation measurements and the technical infrastructure supporting these standards. Such standards and techniques will also address emerging methods to be used in investigations of transported radioactive materials. These projects will provide early responders, as well as laboratories and industries, with equipment and procedures that will assure high accuracy radioactivity and radiation measurements that are vital for detection and prevention, response and recovery, and consequence management subsequent to a radiological event.

As new technologies poise to enter the market, new standards, tests and evaluations are need to verify and validate the efficacy and safety of these new technologies. Particularly for early responders who may not have the technical expertise to evaluate all the potential instrumentation, protocols and training will be critical for efficient prevention and/or response to potential radiological events.

Impact to Homeland Security: To provide homeland security personnel, early responders, health physicists, and cleanup crews with the proper equipment and training for monitoring the import, transport or storage of radioactive materials to help prevent a potential radiological attack or accident, and managing the consequences in the event of such an occurrence so as to minimizes the risk to victims, people in the nearby vicinity and themselves, and contains the spread of the radioactive material, leading directly to the saving of lives, protection of health and reduction of clean-up costs. This project provides information for the purchase and use of equipment for safe and efficient operation in response to a radiological situation. Standardization of radiation and radioactivity measurements also enables laboratories and industries involved in detection and recovery efforts to respond in a more efficient way (lower cost and shorter turn-around-time) as well as provide quality assurance in such measurements.

Background/Problem: The proper equipment and training is required by controllers (borders, ports, etc.) and first responders to deal with a radiological threat or incident, and the authorities purchasing equipment for our early responders need guidance concerning what equipment to buy and the emergency personnel need training on the proper use of the equipment. Standards, testing and evaluation, and guidance on use and calibration for radioactivity measuring equipment are needed by early responders, as well as guidance on

existing equipment that meet the standards. In addition, there is a need for accurate, fast and effective measurements of very low levels of radionuclides in difficult-to-purify samples such as dirt and building materials which is addressed by this effort. Finally, there is a critical need for improved assurance of adequate dose for bioagent deactivation without undue damage of material goods, provided by the improved dosimetry of high-energy irradiators of this project.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

Because of the breadth of impact of the 4 ANSI standards on radiation detection equipment for homeland security, efforts have also been in place, in cooperation with the Office of Domestic Preparedness, DHS (through the Office of Law Enforcement Standards at NIST), to include specifications of particular importance to early responders in the field (police, fire, rescue, etc.).

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

The current ANSI standards have focused on equipment to be used by first responders to a radiological event. Clean-up and repopulation will require monitoring a wider range of dose rates (to the lower end), use of a greater variety of detection equipment (typical detectors for health physics) and a diverse cadre of personnel (health physicists, medical evaluation team, clean-up and construction crews). The same types of approaches to evaluating the performance of detectors for early and first responders (check sources, radiation field measurements, etc.) will be used for this type of instrumentation. In addition, new chemical methodologies and atom counting techniques will be investigated for more sensitive measurements of very low levels of radionuclides in man-made and construction materials.

A center for computational radiation physics to provide feasibility, design/optimization, and radiation-protection studies for proposed and existing systems dealing with ionizing radiation that might be deployed for homeland security will be developed. This draws on our recognized expertise in the development and use of radiation-transport Monte Carlo codes and our success in previous projects, ranging from space-radiation detection and shielding to mail irradiation. Ultimately, this will provide accurate, reliable, fast and less-expensive means to determine the adequacy, optimization and safety of such systems. A high-power accelerator system will also be developed. This facility, donated by the US Postal Service, will serve as a test bed for high-energy irradiation to inactivate bioterror agents in mail, packages, luggage, etc., as a pre-emptive protection measure, and to sanitize bodies/equipment contaminated by chemical and bio weapons. A clear matrix of applications, required detection sensitivities/capabilities, environmental conditions, and testable specifications for instruments required for the clean-up phase of emergency response will be established, leading to the creation of a type testing regime, similar to an "Underwriters Lab" or MSA stamp of approval, to qualify instruments for these applications.

Efforts in neutron spectrometry to support detection of neutron sources as well as neutron interrogation methods for detection of illicit materials will expand. Very-low-level check sources will be calibrated by fission counting of thin ^{252}Cf deposits which can be removed from their containment. Although these sources are not suitable for distribution to first

responders, they will provide critical support for subsequent neutron measurements at NIST. A 14 MeV neutron generator will be procured and calibrated relative to NBS-I using a ^{252}Cf source and sulfur pellet activation as a transfer method. This will be based on spectrum averaged cross section ratios for the ^{252}Cf source and the accelerator source. This almost monoenergetic fast neutron source will be used in sensitivity and resolution test of advanced spectrometry systems. Calibration of current-technology neutron spectrometry instruments relative to NIST standards will permit immediate response to requests for radiation protection measurements relative to the use of accelerator devices in homeland security applications. Finally, data acquisition and analysis software will be upgraded for investigations of time-correlations in cosmic-ray neutron background. This correlation information will be used to improve the rejection of false positives in neutron detection for interdiction of contraband nuclear devices.

TECHNICAL PROGRAM MANAGER'S SUMMARY DATASHEET

PROGRAM TITLE: MECHANICAL PROPERTIES OF INFRASTRUCTURE MATERIALS

AGENCY/DEPARTMENT: NIST

PRIMARY CONTACT PERSON: Carol Handwerker

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): *(limit to 150 words)*

Development and innovative use of state-of-the-art measurement systems of the behavior of structural materials under extreme conditions, such as high rates of loading, high temperatures, or unusual environments (e.g., deep underwater). Integration of these measurements into models of key elements of the Nation's infrastructure for use in simulation of structures subjected to extreme conditions, whether natural and human-induced. Use knowledge gained in measurements and simulations as input to changes in standards and codes.

Impact to Homeland Security: *(What is the outcome? Money saved, lives saved, better protection, support prosecution or forensic investigation, etc.? limit to 150 words)*

Increase resilience of the Nation's infrastructure to terrorist attack, with the ultimate goal of saving lives and maintaining a functional infrastructure system if such an attack occurs.

Background/Problem: *(What is the fundamental issue? E.g., lack of standards for bio agent detection? Inadequate technology for ...? limit to 150 words)*

Materials behavior under extreme conditions differs dramatically from its behavior under conditions for which is normally designed, for example, maximum loads under normal use and ambient temperature. New measurement methods are needed to integrate CIP needs with design needs for normal use.

Related Efforts: *(At NIST, DHS, NSF or at other agencies. limit to 150 words)*

This effort is at NIST and is integral to the NIST CIP effort

Proposed Program 2005-2007 Research/Plan: *(limit to 500 words)*

Expand measurement capability to cover full range of materials (metals, ceramics, polymers), high strain rate testing under the full range of stress states, a wide range of testing temperatures simulating the possible range of adverse conditions.

Provide assistance to government agencies on homeland security and infrastructural issues. Current projects include assessing the performance of structural steels as part of the NIST World Trade Center Investigation, advising the Bureau of Reclamation on metallurgical issues involving pipelines and dams, advising the Department of the Interior on the structural integrity of the U.S.S. Arizona Memorial, and collaborating with both the Department of Transportation and the Department of Energy on pipeline safety issues.

PROGRAM TITLE: SAFETY OF THREATENED BUILDINGS

AGENCY/DEPARTMENT: National Institute of Standards and Technology,
Technology Administration, U.S. Department of Commerce

PRIMARY CONTACT PERSON: Dr. William Grosshandler, 301-975-2310

Program Status: ☒ Current or ongoing ☐ Proposed

Technical Program Objective(s): To provide a technical foundation that supports improvements to codes, standards, data, and practices that reduces the impact of extreme threats to the safety of buildings, their occupants, and emergency responders.

The Program will develop and disseminate guidance and tools, assess and reduce building vulnerabilities, and produce the technical basis for cost-effective changes in national practices, standards, and codes. Implementation of the results will better protect building occupants and property in the future, will enhance the safety of fire and emergency responders, and will help restore public confidence in tall buildings by making buildings safer nationwide.

Impact to Homeland Security: Codes and standards will be adapted to account for the true magnitude of actual structural loads, and of the uncertainty in response of the complex building frame to these loads. The prediction of failure modes in a closely-coupled building system and standard test methods will determine the expected performance of the building should the mechanical or thermal loads exceed a prescribed value. Building designers, operators, occupants, and first responders need precise information when faced with possible blast and other extreme events unforeseen as little as three years ago.

Background/Problem: Traditionally building and fire codes in the United States exist, among other reasons, to ensure the safety of occupants in the event of anticipated excessive loads due to wind, earthquake, and snow, and the likelihood of a probable worst-case fire. The tragic collapse of the World Trade Center buildings in 2001 has focused the general public, governments at all levels, and the construction industry on the need to understand the possible impacts of terrorist acts on building operations, structural integrity, and emergency response procedures. The standard test methods and building practices upon which current building and fire codes are based rank the performance of one material, component, or system against alternative designs, with the expectation that some minimum rating translates into a sufficient level of safety of the material, component, or system when installed in the actual building. A comprehensive treatment is needed for these new performance requirements.

Related Efforts: The Department of Defense and U.S. Army Corp of Engineers have extensive experience in technical requirement for protecting buildings from blast events.

Proposed Program 2005-2007 Research/Plan: Four general areas of research have been targeted to support near and long-term improvements to reduce the vulnerability of the structure, building occupants, and first responders to extreme threats.

Increasing Structural Integrity Structural integrity will be increased through the development and implementation of performance criteria for codes and standards, tools, and practical guidance for prevention of progressive structural collapse. System design concepts, retarded collapse mechanisms, built in redundancy, and hardening structures through retrofit will be considered. Performance criteria for fire safety design and retrofit of structures will be developed through examination of five key factors: the suitability of standard fire resistance test methods; the role of structural connections, diaphragms, and redundancy in enabling load transfer and maintaining overall structural integrity; the effectiveness of alternative retrofit, design, and fire protection strategies to enhance structural fire endurance; the fire behavior of structures built with innovative materials; and models to predict the fire hazard to structures from internal and external fires.

High Performance Steel and Fire Resistance Materials High performance steels exist and are in use elsewhere in the world. More efficient and accurate tests for performance of steels under extreme events are needed and will be developed to help industry incorporate the use of high performance steels into U.S. construction practice. Fundamental mechanical and thermal properties of fire protective materials will be measured. Innovative test methods and instrumentation, building upon our vast experience in cementitious materials and thermal conductivity measurement techniques, will be developed for this purpose. A database that spans the full range of expected temperatures and mechanical loads will be developed to support the implementation of meaningful performance codes and design criteria.

Improving Emergency Egress and Access By working with the primary stakeholders, the role of elevators in providing access by the first responders in a high rise building will be greatly enhanced over current practice. The development of hardened fire service elevators and new emergency operation procedures/controls will also lead to improved egress capabilities from tall buildings, especially for mobility-impaired or injured occupants. The behavior of people in an emergency situation has been altered in unpredictable ways by the events of 9/11. Behavioral and engineering studies will be conducted, drawing on experts in academia and elsewhere, to enable the development of simulation tools that better capture the movement of people within a building under fire and other emergency situations.

Developing Building and Equipment Standards and Guidelines Partnering with the American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and federal agencies, NIST-developed indoor air quality simulation tools will be extended to analyze and guide the assessment and subsequent reductions in the vulnerability of buildings to chemical/biological/radiological attacks. Standard building information models that facilitate the simulation of building system behavior during adverse events are being developed to allow communication among IAQ controls and other building controls associated with security, transportation, energy, and fire alarm systems.

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